# DRAFT DESCRIPTIONS OF SYSTEMS, MAPPING SUBSYSTEMS, AND VEGETATION TYPES FOR PHASE IV

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30 November 2011

The following descriptions cover the systems that have been identified for the legend for Phase IV of the Ecological Systems Classification and Mapping Project in support of the Texas Comprehensive Wildlife Conservation Strategy for the Texas Parks and Wildlife Department. Many of these descriptions were drafted from System descriptions available from NatureServe (http://www.natureserve.org/explorer/). Most System descriptions were modified, and all Vegetation Type descriptions were generated from discussions regarding these cover types. These brief narratives generally focus on 'typical' type concepts, and mapped vegetation types often circumscribe more variation on the ground than what is described here. For each system, a number of cover types, or "Vegetation Types" were described. A common name is given for each Vegetation Type, and this name is used in the table of contents and for the map legend. Additionally, a second name is provided which more directly ties the Vegetation Type to the system of which it is a part. A numeric identifier is also provided. This identifier represents the identifier used by NatureServe for the system. For the Vegetation Type, a digit suffix is provided to distinguish the various cover types within the system. In parentheses directly following the common name of the Vegetation Type, a number is provided. This number represents the numeric code used to track the Vegetation Types during the mapping process.

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## Forests, Woodlands and Savannas

**Edwards Plateau Limestone Savanna and Woodland**
**Identifier**: CES303.660

**Geology:** Primarily found on Cretaceous limestones of the Edwards Plateau.
**Landform:** Rolling to level topography, often on plateau tops, but also on gentle slopes.
**Soils:** Generally loams, clay loams, or clays, often with limestone parent material apparent. Low Stony Hill, Adobe, Clay Loam, and Shallow Ecological Sites are commonly associated with this system.

**Description:** This upland system forms the matrix vegetation type of the Edwards Plateau. It is typified by a mosaic of evergreen oak and juniper forests, woodlands and savannas over shallow soils of rolling uplands and adjacent upper slopes within the Edwards Plateau and some adjacent ecoregions where limestone is present. Significant open areas dominated by grasses may resemble prairies, and such open occurrences may grade into prairie types to the west (shortgrass prairie), northwest (Central mixedgrass), and east (Blackland). Species such as *Quercus fusiformis* (plateau live oak) or *Juniperus ashei* (Ashe juniper) often dominate the canopy of this system. Other canopy species may include *Quercus buckleyi* (Texas oak), *Quercus laceyi* (Lacey oak, in the southwestern part of the Edwards Plateau), *Ulmus crassifolia* (cedar elm), *Fraxinus texensis* (Texas ash), *Quercus sinuata* var. *breviloba* (white shin oak), and *Quercus vaseyana* (Vasey shin oak). *Pinus remota* (paper-shell pinyon) and *Juniperus pinchotii* (redberry juniper) may dominate or be a component of the canopy to the southwest. The shrub layer may be fairly well-developed, containing overstory species, as well as species such as *Diospyros texana* (Texas persimmon), *Mahonia trifoliolata* (agarito), *Sophora secundiflora* (Texas mountain-laurel), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), *Prosopis glandulosa* (honey mesquite), and *Cylindropuntia leptocaulis* (tasajillo). Many uplands have mottes of *Quercus fusiformis* (plateau live oak) punctuating a generally grass dominated landscape, forming what has been referred to as a motte-savanna. The understory can contain various grass species, including *Schizachyrium scoparium* (little bluestem), *Aristida purpurea* (purple threeawn), *Bouteloua curtipendula* (sideoats grama), *Bothriochloa barbinodis* (cane bluestem), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Nassella leucotricha* (Texas wintergrass), *Sorghastrum nutans* (Indiangrass), *Hilaria belangeri* (curlymesquite), *Buchloe dactyloides* (buffalograss), *Andropogon gerardii* (big bluestem), *Bouteloua hirsuta* (hairy grama), *Bouteloua rigidiseta* (Texas grama), *Muhlenbergia reverchonii* (seep muhly), *Muhlenbergia lindheimeri* (Lindheimer muhly), and/or *Carex planostachys* (cedar sedge). The composition of the grassland component is driven by grazing, fire, and climate. Shortgrass species such as *Buchloe dactyloides* (buffalograss) and *Hilaria belangeri* (curlymesquite) are favored under heavy continuous grazing and/or dry climate (to the west), while mid- and tallgrasses are favored under more mesic conditions, more well-developed soils, and well-managed grazing. The herbaceous stratum is often dominated by non-native grass species, especially *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), though less so to the west. Some disturbed areas on hard-bedded limestone of the western plateau are now dominated

by mesquite woodland. Natural mesquite woodlands are believed to have occurred on the deeper soils of adjacent riparian systems.

**VEGETATION TYPES:**

**Edwards Plateau: Ashe Juniper Motte and Woodland (1101)**

Edwards Plateau Limestone Ashe Juniper Motte and Woodland
**Identifier**: CES303.660.1 **MoRAP Code:** 1101
**Description:** These relatively closed woodlands are very common on uplands on limestone in the Edwards Plateau and adjacent ecoregions. *Juniperus ashei* (Ashe juniper) is the clear dominant in the canopy and a conspicuous component of the shrub layer as well, though *Juniperus pinchotii* (redberry juniper) becomes increasingly common to the west. Occurrences containing thick stands of juniper are sometimes referred to as "cedar breaks." *Quercus fusiformis* (plateau live oak) is often a significant component in the canopy, and other species such as *Quercus buckleyi* (Texas oak), *Quercus sinuata* var. *breviloba* (white shin oak), *Quercus vaseyana* (Vasey shin oak), *Quercus laceyi* (Lacey oak), *Ulmus crassifolia* (cedar elm), *Pinus remota* (paper-shell pinyon) and *Celtis* spp. (hackberry) may also be common. The shrub layer may be dense and dominated by *Juniperus ashei* (Ashe juniper), but *Mahonia trifoliolata* (agarito), *Sophora secundiflora* (Texas mountain-laurel), *Diospyros texana* (Texas persimmon), and other species may be present. Dense canopy cover often leads to a sparse to nearly absent herbaceous layer, sometimes with only *Carex planostachys* (cedar sedge) present. In the southwestern portion of the Edwards Plateau, *Pinus remota* (papershell pinyon) and *Quercus laceyi* (Lacey oak) may be a common in the overstory. These sites tend to appear more open, but retain *Juniperus ashei* (Ashe juniper) or *Juniperus pinchotii* (redberry juniper) as a significant component of the overstory and shrub layers. Pinyon woodlands tend to occur on relatively xeric sites and have a sparse herbaceous layer with species such as *Bouteloua curtipendula* (sideoats grama), *Hilaria belangeri* (curlymesquite), *Erioneuron pilosum* (hairy tridens), and others.

**Edwards Plateau: Live Oak Motte and Woodland (1102)**

Edwards Plateau Limestone Live Oak Motte and Woodland
**Identifier**: CES303.660.2 **MoRAP Code:** 1102
**Description:** These relatively closed woodlands are common throughout the Edwards Plateau and adjacent ecoregions on limestone. *Quercus fusiformis* (plateau live oak) dominates the overstory, however other species such as *Quercus sinuata* var. *breviloba* (white shin oak), *Ulmus crassifolia* (cedar elm), *Quercus buckleyi* (Texas oak), *Celtis* spp. (hackberry), *Quercus laceyi* (Lacey oak), and *Quercus vaseyana* (Vasey shin oak) may also be present to common. *Juniperus ashei* (Ashe juniper) or *Juniperus pinchotii* (redberry juniper) may be present in the canopy and shrub layer, but are usually not dominant. The shrub layer is generally patchy and may include species such as *Diospyros texana* (Texas persimmon), *Mahonia trifoliolata* (agarito), *Prosopis glandulosa* (honey mesquite), *Opuntia engelmannii* (pricklypear), and *Opuntia leptocaulis* (tasajillo), as well as small individuals of the overstory species. The herbaceous layer may be sparse if canopy cover is high, with species including *Bouteloua* spp. (grama), *Nassella leucotricha* (Texas wintergrass), *Aristida* spp. (threeawn), *Bothriochloa laguroides* ssp.

*torreyana* (silver bluestem), and *Carex planostachys* (cedar sedge). Fires in this system tend to remove shrub species (especially *Juniperus ashei* (Ashe juniper)), but the overstory typically remains intact. Openings between mottes are typically grass-dominated with the same species that occur as understory components in the woodlands.

**Edwards Plateau: Deciduous Oak / Evergreen Motte and Woodland (1103)**
Edwards Plateau Limestone Deciduous-Evergreen Motte and Woodland
**Identifier:** CES303.660.4 **MoRAP Code:** 1103
**Description:** These woodlands are intermediate between those strongly dominated by the evergreen components *Juniperus ashei* (Ashe juniper) and *Quercus fusiformis* (plateau live oak) and those dominated by deciduous components, particularly oaks such as *Quercus buckleyi* (Texas Oak), *Quercus sinuata* var. *breviloba* (white shin oak), and *Quercus laceyi* (Lacey oak). Other deciduous overstory species that may be present include *Ulmus crassifolia* (cedar elm) and *Celtis* sp. (hackberry). The understory of these sites is similar to that of the related woodlands with shrub species such as *Diospyros texana* (Texas persimmon), *Mahonia trifoliata* (agarito), *Sophora secundiflora* (Texas mountain-laurel), and *Opuntia engelmannii* (pricklypear), and relatively sparse herbaceous layer typically dominated by graminoid species common to the surrounding upland sites such as *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), *Schizachyrium scoparium* (little bluestem), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Diachanthelium* sp. (rosette grass), *Bouteloua* sp. (grama), *Nassella leucotricha* (Texas wintergrass) and others.

**Edwards Plateau: Oak / Hardwood Motte and Woodland (1104)**
Edwards Plateau Limestone Deciduous Motte and Woodland
**Identifier:** CES303.660.5 **MoRAP Code:** 1104
**Description:** While *Quercus buckleyi* (Texas oak) and *Ulmus crassifolia* (cedar elm) are significant elements of the canopy of nearby slope forests and woodlands, they may also dominate upland sites. Other deciduous species, such as *Quercus sinuata* var. *breviloba* (white shin oak), *Celtis laevigata* (sugar hackberry), *Prosopis glandulosa* (mesquite), and *Quercus stellata* (post oak), may also occupy the canopy, with lesser amounts of evergreen components, such as *Quercus fusiformis* (live oak) and *Juniperus ashei* (Ashe juniper), present. These sites with dominant deciduous canopies on upland Ecological Sites (such as Low Stony Hill, Shallow, and Adobe) are less commonly encountered than woodlands dominated by some mix of an evergreen canopy.

**Edwards Plateau: Post Oak Motte and Woodland (1114)**
Edwards Plateau Limestone Post Oak Motte and Woodland
**Identifier**: CES303.660.6 **MoRAP Code:** 1114
**Description:** These woodlands and mottes tend to occur on Redland Ecological Sites, but may also be found on sandy benches. On the Edwards Plateau, Redland sites are often associated with cherty or siliceous members of limestone formations such as Edwards Limestone. These situations provide slightly more acidic conditions relative to the surrounding landscape. The overstory tends to be open and dominated by *Quercus stellata* (post oak), though *Quercus marilandica* (blackjack oak), *Quercus fusiformis* (plateau live oak), *Ulmus crassifolia* (cedar elm), *Juniperus ashei* (Ashe juniper), and

*Quercus buckleyi* (Texas oak) may also be present. The shrub layer is patchy and may contain small individuals of the canopy species as well as other species. The herbaceous layer is often dominated by *Schizachyrium scoparium* (little bluestem), *Nassella leucotricha* (Texas wintergrass), *Bouteloua curtipendula* (sideoats grama), and other species, but may be dominated by the non-native *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem).

**Edwards Plateau: Savanna Grassland (1107)**
Edwards Plateau Limestone Savanna Grassland
**Identifier:** CES303.660.9 **MoRAP Code:** 1107
**Description:** Uplands of the Edwards Plateau are frequently described as a mosaic of woodlands, shrublands, and grasslands. Areas with reduced woody cover may occupy sites of considerable size, depending on the land use history, management, and fire history. While these sites have sometimes been referred to as prairies, they are more appropriately considered a part of the savanna mosaic. Grasslands in areas transitioning to regions with a prairie matrix (such as the northwestern transitions to shortgrass prairie and northern transitions to mixedgrass prairie), may closely resemble and be difficult to distinguish from these prairie types. *Nassella leucotricha* (Texas wintergrass), *Bouteloua curtipendula* (sideoats grama), *Schizachyrium scoparium* (little bluestem), and *Hilaria belangeri* (curlymesquite) are common dominants on these sites, but *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem) and/or *Cynodon dactylon* (Bermuda grass) frequently dominate or are significant components. Numerous other grass species, including *Aristida* sp. (threeawn), *Bothriochloa barbinodis* (cane bluestem), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Sorghastrum nutans* (Indiangrass), *Bouteloua hirsuta* var. *pectinata* (tall grama), *B. trifida* (red grama), *B. rigidiseta* (Texas grama), *Bouteloua hirsuta* (hairy grama), *Erioneuron pilosum* (fluffgrass), and many others may be present or dominate these sites. Open, gentle slopes underlain by Glen Rose Limestone often maintain grasslands that are sometimes dominated by *Bouteloua pectinata* (tall grama) and *Muhlenbergia reverchonii* (seep muhly). Sites under heavy, continuous grazing, or sites with thin or xeric soils tend to be dominated by shortgrass species such as *Buchloe dactyloides* (buffalograss), *Hilaria belangeri* (curlymesquite), or *Erioneuron pilosum* (fluffgrass). Numerous forb species are also present in the herbaceous layer. Woody cover usually constitutes less than 25% of the canopy and is made up of various species including, but not limited to, *Prosopis glandulosa* (honey mesquite), *Juniperus ashei* (Ashe juniper), *Mahonia trifoliolata* (agarito), *Quercus sinuata* var. *breviloba* (white shin oak), *Quercus fusiformis* (plateau live oak), *Diospyros texana* (Texas persimmon), and/or *Sophora secundiflora* (Texas mountain-laurel).

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**Edwards Plateau Dry-Mesic Slope Forest and Woodland**
**Identifier**: CES303.656

**Geology:** Found on limestone slopes within the Edwards Plateau and adjacent ecoregions.
**Landform:** Slopes generally greater than 20 percent.

**Soils:** Stones and boulders are conspicuous on the soil surface. Soils are generally dark clay to clay loam and shallow. Steep Rocky and Steep Adobe Ecological Sites may be associated with this system.

**Description:** This system occurs on dry to mesic, middle slopes of the rolling uplands and escarpments of the Edwards Plateau and similar sites. The canopy is typically dominated or co-dominated by deciduous trees, including *Quercus buckleyi* (Texas oak), *Quercus laceyi* (Lacey oak), *Quercus sinuata* var. *breviloba* (white shin oak), *Fraxinus texensis* (Texas ash), *Ulmus crassifolia* (cedar elm), *Prunus serotina* ssp. *eximia* (escarpment black cherry), *Juglans major* (Arizona walnut), and/or *Celtis laevigata* var. *reticulata* (netleaf hackberry). *Quercus fusiformis* (plateau live oak) and *Juniperus ashei* (Ashe juniper) are often present and are sometimes co-dominant with deciduous species of this system. Canopy closure is variable, and this system can be expressed as forests or woodlands. The shrub layer may be well-represented, especially where the overstory canopy is discontinuous. Species such as *Aesculus pavia* var. *flavescens* (red buckeye), *Cercis canadensis* var. *texensis* (Texas redbud), *Forestiera pubescens* (elbowbush), *Ungnadia speciosa* (Mexican buckeye), *Ceanothus herbaceus* (Jersey tea), *Frangula caroliniana* (Carolina buckthorn), *Sophora secundiflora* (Texas mountain-laurel), *Viburnum rufidulum* (rusty blackhaw), *Rhus* spp. (sumac), *Vitis* spp. (grape), and *Garrya ovata* (silktassel) may be present in the shrub layer. With the large amount of exposed rock, frequent accumulation of leaf litter, and significant canopy closure, herbaceous cover is generally sparse, with *Carex planostachys* (cedar sedge) often present. Woodland forbs such as *Tinantia anomala* (widowstears), *Chaptalia texana* (silver-puff), *Nemophila phacelioides* (baby blue-eyes), *Salvia roemeriana* (cedar sage), *Lespedeza texana* (Texas lespedeza), and various ferns may also be present, if patchy.

**VEGETATION TYPES:**

**Edwards Plateau: Ashe Juniper Slope Forest (901)**
Edwards Plateau Ashe Juniper Dry-Mesic Slope Forest and Woodland
**Identifier**: CES303.656.1 **MoRAP Code:** 901
**Description:** Forest or woodland of slopes generally greater than 20 percent on steep rocky sites with coniferous evergreen canopy cover. The canopy of these sites is dominated by *Juniperus ashei* (Ashe juniper), but usually with *Quercus fusiformis* (plateau live oak) and a deciduous component present (often *Quercus buckleyi* (Texas oak), *Quercus sinuata* var. *breviloba* (white shin oak), *Quercus pungens* (sandpaper oak), or *Quercus laceyi* (Lacey oak), at least). The canopy is usually relatively closed and the sites are rocky, resulting in a sparse and depauperate shrub and herbaceous layer. However, *Juniperus ashei* (Ashe juniper) may also form a somewhat dense layer to within a meter of the forest floor. *Sophora secundiflora* (Texas mountain-laurel), *Diospyros texana* (Texas persimmon), *Mahonia trifoliolata* (agarito), *Mimosa borealis* (fragrant mimosa), *Quercus sinuata* var. *breviloba* (white shin oak), and *Sideroxylon lanuginosum* (gum bumelia) may also be components of the shrub layer. These juniper dominated slopes tend to be drier, and may be more frequent on slopes with south and west aspects.

**Edwards Plateau: Live Oak Slope Forest (902)**
Edwards Plateau Live Oak Dry-Mesic Slope Forest and Woodland

**Identifier:** CES303.656.2 **MoRAP Code:** 902
**Description:** Forest or woodland dominated by *Quercus fusiformis* (plateau live oak) and occupying generally rocky sites on slopes greater than 20 percent. *Juniperus ashei* (Ashe juniper) is typically present, and may be particularly conspicuous as an understory component. Deciduous species such as *Quercus buckleyi* (Texas oak), *Quercus sinuata* var. *breviloba* (white shin oak), *Quercus laceyi* (Lacey oak), *Ulmus crassifolia* (cedar elm), and others may also be present in the canopy. These sites tend to be drier than similar sites that are dominated by a mix of deciduous species in the canopy. The shrub layer is variable and may contain small individuals of the canopy species, as well as species such as *Sophora secundiflora* (Texas mountain-laurel), *Dispyros texana* (Texas persimmon), *Sideroxylon lanuginosum* (gum bumelia), and *Mahonia trifoliolata* (agarito). Relatively closed canopy, rocky substrate, and significant litter layer results in a sparse herbaceous layer.

**Edwards Plateau: Oak / Ashe Juniper Slope Forest (903)**
Edwards Plateau Oak-Ashe Juniper Dry-Mesic Slope Forest and Woodland
**Identifier:** CES303.656.4 **MoRAP Code:** 903
**Description:** Forests or woodlands on steep rocky slopes, co-dominated by *Juniperus ashei* (Ashe juniper) and deciduous species such as *Quercus buckleyi* (Texas oak), *Quercus laceyi* (Lacey oak), *Quercus muehlenbergii* (chinkapin oak), and *Quercus sinuata* var. *breviloba* (white shin oak). Other deciduous hardwood species such as *Ulmus crassifolia* (cedar elm), *Juglans major* (Arizona walnut), *Prunus serotina* var. *eximia* (escarpment black cherry), *Celtis reticulata* (netleaf hackberry), and *Fraxinus texensis* (texas ash) may also be present to common. *Quercus fusiformis* (plateau live oak) is also frequently conspicuous in the canopy. *Pinus remota* (paper-shell pinyon) may also be present in the canopy. These sites are intermediate in dryness between juniper dominated slopes and those dominated by deciduous hardwood species. *Juniperus ashei* (Ashe juniper) may reach large sizes on such slopes. The shrub layer is variable but may be well-developed within canopy gaps. Species in the shrub layer may include *Sophora secundiflora* (Texas mountain-laurel), *Forestiera reticulata* (netleaf forestiera), *Ugnadia speciosa* (Mexican buckeye), *Diospyros texana* (Texas persimmon), *Aesculus pavia* var. *flavescens* (red buckeye), *Cercis canadensis* var. *texensis* (Texas redbud), *Sideroxylon lanuginosum* (gum bumelia), and others. The herbaceous layer is generally sparse and depauperate

**Edwards Plateau: Oak / Hardwood Slope Forest (904)**
Edwards Plateau Deciduous Dry-Mesic Slope Forest and Woodland
**Identifier:** CES303.656.6 **MoRAPCode:** 904
**Description:** Forest or woodland on slopes generally greater than 20 percent on steep rocky sites with significant deciduous canopy cover. These sites tend to be somewhat more mesic than similar sites dominated by evergreen canopy. The overstory may be diverse, with species such as *Quercus buckleyi* (Texas oak), *Quercus laceyi* (Lacey oak), *Quercus sinuata* var. *breviloba* (white shin oak), *Quercus muehlenbergii* (chinkapin oak), *Ulmus crassifolia* (cedar elm), *Celtis laevigata* var. *reticulata* (netleaf hackberry), *Fraxinus texensis* (Texas ash), *Prunus serotina* var. *eximia* (escarpment black cherry), *Juglans major* (Arizona walnut), and others. *Quercus fusiformis* (plateau live oak) and

*Juniperus ashei* (Ashe juniper) present. Individuals of these species often reach large size under these conditions. Species such as *Aesculus pavia* var. *flavescens* (red buckeye), *Cercis canadensis* var. *texensis* (Texas redbud), *Cornus drummondii* (rough-leaf dogwood), *Forestiera pubescens* (elbowbush), *Ungnadia speciosa* (Mexican buckeye), *Ceanothus herbaceus* (Jersey tea), *Frangula caroliniana* (Carolina buckthorn), *Viburnum rufidulum* (rusty blackhaw), *Vitis* spp. (grape), and *Garrya ovata* (silktassel) tend to occur in the shrub layer more frequently in this vegetation type than in the evergreen vegetation types of this system. Though dense canopy, rocky substrate, and significant litter accumulation results in a sparse herbaceous layer, forbs such as *Tinantia anomala* (widowstears), *Chaptalia texana* (silver-puff), *Nemophila phacelioides* (baby blue-eyes), *Salvia roemeriana* (cedar sage), *Lespedeza texana* (Texas lespedeza), and various ferns may be present, if patchy.

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**Edwards Plateau Mesic Canyon (not mapped)**
**Identifier**: CES303.038

**Geology:** Associated with lower Cretaceous limestones of the Edwards Plateau, often on the Glen Rose or related formations.

**Landform:** This system occurs on lower slopes (toe slopes) and onto the margins of adjacent valleys of small drainages. Occurrences are generally found in steep canyons where insolation is minimal, or on lower positions on north facing slopes.

**Soils:** Rich loams, often very rocky, with little soil development. Steep Rocky Ecological Site, in part.

**Description:** Currently this system is not mapped individually, but will occur as inclusions within mapped Edwards Plateau slope, riparian, or floodplain forests. Its presence at lower slope positions make it transitional between slope and riparian/floodplain systems. This system is largely endemic to the Edwards Plateau ecoregion and occurs on canyon bottoms, mesic lower slopes and steep canyons, primarily in the Southern Balcones Escarpment, but also in the Eastern Balcones Escarpment (also on the Limestone Cutplain). This system also includes areas of cliff faces and lower slopes of boxed canyons occurring as narrow, sometimes long bands in areas often with seeps where moisture is consistently more available than on adjacent slopes. The tree canopy is generally closed. Common components include *Ulmus crassifolia* (cedar elm), *Juglans major* (Arizona walnut), *Quercus buckleyi* (Texas oak), *Quercus laceyi* (Lacey oak), *Prunus serotina* var. *eximia* (escarpment black cherry) (becoming less common to the north), *Fraxinus texensis* (Texas ash) (dominant in the northeastern plateau), *Quercus muehlenbergii* (chinkapin oak), *Tilia americana* (American basswood), and *Acer grandidentatum* (bigtooth maple). Canyon bottoms may have scattered *Quercus macrocarpa* (bur oak). Substrate (limestone) and topographic position (north and east aspects and lower slopes) are the dominant characteristics of this system. Small seepage areas may be identified as the Edwards Plateau Cliff system, and are often dominated by *Adiantum capillus-veneris* (maiden-hair fern), with *Thelypteris ovata* var. *lindheimeri* (Lindheimer's maidenfern) on nearby moist habitats. Fire probably plays little role in the system, while grazing and browsing (by native as well as exotic ungulates) may play an important role in recruitment and understory composition. Adjacent, drier slopes are usually dominated by various *Quercus* species and *Juniperus ashei* (Ashe juniper). Woodlands and

forests downslope of occurrences of this system may be well-developed riparian woodlands, small stringers of *Platanus occidentalis* (American sycamore), or this system may occupy the lowest topographic positions along extremely small, rocky drainages.

**VEGETATION TYPES:**

**Edwards Plateau Bigtooth Maple Mesic Canyon (not mapped)**
**Identifier**: CES303.038.1 **MoRAP Code:** not mapped
**Description:** This vegetation type occupies the most mesic sites and are characterized by the presence of *Acer grandidentatum* (bigtooth maple). *Quercus muehlenbergii* (chinkapin oak) is a common associate, along with *Prunus serotina* var. *eximia* (escarpment black cherry), *Juglans major* (Arizona walnut), and other deciduous species. Overstory is usually a closed canopy. Mesic indicators such as *Aquilegia canadensis* (wild columbine) and *Clematis texensis* (scarlet clematis) may be present. This system is found throughout the range of the system.

**Edwards Plateau Mixed Deciduous Mesic Canyon (not mapped)**
**Identifier**: CES303.038.2 **MoRAP Code:** not mapped
**Description:** Occurrences are somewhat drier than the similar Bigtooth Maple sites, and lack *Acer grandidentatum* (bigtooth maple). Sites are characterized by the presence of a relatively closed canopy of deciduous hardwoods, including *Quercus muehlenbergii* (chinkapin oak), *Q. buckleyi* (Texas oak), *Q. laceyi* (Lacey oak), *Prunus serotina* var. *eximia* (escarpment black cherry), *Juglans major* (Arizona walnut), and *Ulmus rubra* (slippery elm).

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**East-Central Texas Plains Post Oak Savanna and Woodland**
**Identifier**: CES205.679

**Geology:** Typically on sedimentary formations of Tertiary age, including Eocene sands such the Queen City, Sparta, and Carrizo Sands, as well as the Wilcox and Claiborne groups. The system also occupies other Teritary formations such as the Goliad and Willis, as well as portions of the Quaternary Willis Formation.
**Landform:** This system occupies gently rolling to hilly topography. It is moderately dissected by drainages.
**Soils:** This system usually occurs on sandy to sandy loam soils, often with a marked clay subsurface horizon. Soils of this system are generally Alfisols, and are typically acidic to neutral. Typical Ecological Sites include Claypan Savannah, Claypan Prairie, Sandy Loam, Sandy, and Deep Sand.

**Description:** Occurrences in Phase 4 represent the southwestern most extension of this system. These savannas and woodlands are typically dominated by *Quercus stellata* (post oak), *Quercus marilandica* (blackjack oak), and *Carya texana* (black hickory), though these species are reaching the edge of their range in this phase. Areas of woodland are dominated or co-dominated by *Quercus fusiformis* (plateau live oak). Other species, such as *Ulmus crassifolia* (cedar elm), *Celtis laevigata* (sugar hackberry), and *Prosopis glandulosa* (mesquite) may also be present in

the overstory. Shrubs may attain significant cover in the understory, with species including *Callicarpa americana* (American beautyberry), *Sideroxylon lanuginosum* (gum bumelia), *Crataegus* spp. (hawthorn), *Ilex decidua* (possumhaw), *Toxicodendron radicans* (poison ivy), and *Smilax bona-nox* (saw greenbrier). To the south, this system grades into vegetation more characteristic of south Texas, with *Quercus fusiformis* (plateau live oak) and *Prosopis glandulosa* (honey mesquite) becoming the primary overstory components, and shrubs of south Texas such as *Acacia rigidula* (blackbrush), *Forestiera angustifolia* (desert olive), *Condalia hookeri* (brasil), *Colubrina texensis* (Texas hogplum), *Eysenhardtia texana* (Texas kidneywood), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), and *Diospyros texana* (Texas persimmon) becoming increasingly conspicuous understory components. Mid- and tallgrass species including *Schizachyrium scoparium* (little bluestem), *Sorghastrum nutans* (Indiangrass), and *Panicum virgatum* (switchgrass) are frequent in the understory where light penetration supports herbaceous cover, and also form prairie patches within the savanna, particularly on tighter soils. Other grasses present include *Andropogon gerardii* (big bluestem), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Paspalum plicatulum* (brownseed paspalum), *Nassella leucotricha* (Texas wintergrass), *Dichanthelium* spp. (rosette grasses), *Aristida* spp. (threeawn), and *Sporobolus cryptandrus* (sand dropseed). Non-native grass species such as *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), *Paspalum notatum* (bahiagrass), and *Cynodon dactylon* (Bermudagrass) may dominate some sites. Forbs are often conspicuous, and may include species such as *Croton capitatus* (hog croton), *Gaillardia pulchella* (Indian blanket), *Monarda punctata* (spotted beebalm), *Rudbeckia hirta* (blackeyed Susan), *Phlox drummondii* (Drummond phlox), *Commelina erecta* (erect dayflower), *Acalypha radians* (cardinal's feather), *Verbesina virginica* (frostweed), *Aphanostephus skirrhobasis* (lazy daisy), *Froelichia gracilis* (slender snake cotton), *Cnidoscolus texanus* (Texas bull-nettle), and many others.

Drought, grazing, and fire are the primary natural processes that affect this system. Much of this system has been impacted by conversion to improved pasture or crop production. Overgrazing and fire suppression have led to increased woody cover on most extant occurrences and the invasion of some areas by problematic brush species such as *Prosopis glandulosa* (honey mesquite).

## VEGETATION TYPES:

### Post Oak Savanna: Live Oak Motte and Woodland (602)

East-central Texas Plains Live Oak Motte and Woodland
**Identifier:** CES205.679.2 **MoRAP Code:** 602
**Description:** *Quercus fusiformis* (plateau live oak) dominates the canopy. *Quercus stellata* (post oak) may be present in these woodlands, but typically only as a minor component of the canopy, or it may be completely absent. Occurrences tend to occupy Claypan Savannah and Claypan Prairie ecoclasses, though this cover type is less common than others within these soil types. *Callicarpa americana* (American beautyberry), *Smilax bona-nox* (saw greenbrier), *Sideroxylon lanuginosum* (gum bumelia), *Toxicodendron radicans* (poison ivy), *Vitis mustangensis* (mustang grape), and *Diospyros texana* (Texas persimmon) may be present in the shrub layer. To the south, *Acacia rigidula* (blackbrush), *Colubrina texensis* (Texas hogplum), *Eysenhardtia texana* (Texas

kidneywood), *Forestiera angustifolia* (desert olive), and *Zanthoxylum fagara* (colima) may form a conspicuous shrub layer. *Schizachyrium scoparium* (little bluestem), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), and *Nassella leucotricha* (Texas wintergrass) are among the many species of grass that may be present in the herbaceous layer, though many sites may have *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), *Paspalum notatum* (bahiagrass), or *Cynodon dactylon* (Bermudagrass) as herbaceous dominants.

**Post Oak Savanna: Savanna Grassland (607)**

East-central Texas Plains Post Oak Savanna Grassland
**Identifier:** CES205.679.9 **MoRAP Code:** 607
**Description:** This vegetation type represents the herbaceous expression of the overall system, which is a mosaic of woody and herbaceous cover types as suggested by reference to a savanna. These grasslands are often dominated by mid- and tallgrass species often present in the understory of woody expressions of the system. Dominant species include *Schizachyrium scoparium* (little bluestem), *Sorghastrum nutans* (Indiangrass), and *Panicum virgatum* (switchgrass). Other grasses present include *Andropogon gerardii* (big bluestem), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Paspalum plicatulum* (brownseed paspalum), *Bouteloua curtipendula* (sideoats grama), *Nassella leucotricha* (Texas wintergrass), and *Sporobolus cryptandrus* (sand dropseed). Non-native grass species such as *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), *Paspalum notatum* (bahiagrass), *Panicum coloratum* (kleingrass), *Dichanthium annulatum* (Kleberg bluestem), and *Cynodon dactylon* (Bermuda grass) may dominate some sites. Claypan Savannah and Claypan Prairie ecoclasses may support occurrences of this vegetation type, particularly where land management practices including prescribed fire and other forms of brush management are implemented.

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**Texas Coastal Fringe Forest and Woodland**
**Identifier:** CES203.464

**Geology:** This system occupies Holocene eolian sands of the South Texas Sand.
**Landform:** Generally level to gently rolling landscape. Some dunes occur, adding significant relief to the region. Low swales and round pothole wetlands typify low landscape positions, and significant drainage systems (in the form of streams) are generally lacking.
**Soils:** Sands, particularly deep sands typify this system.

**Description:** This *Quercus fusiformis* (plateau live oak) dominated system occupies deep sands resulting from eolian deposits of Holocene age. Ridge and swale topography characterizes these sites, with some large vegetated dunes present. In addition to forest and woodland, open stands grading into surrounding grasslands occur, as well as dense shrublands dominated (almost to the exclusion of other species) by running clones of *Quercus fusiformis* (plateau live oak). The association CEGL007785 *Quercus fusiformis – Prosopis glandulosa* var. *glandulosa / Malvaviscus arboreus* var. *drummondii* Forest can be referred to these southern expressions in

this phase. The system occurs within a matrix of deep sand grasslands, but also as large patch forests and woodlands. Depending on the overstory canopy and the development of the shrub layer, the herbaceous cover may resemble the surrounding grasslands, at least in composition. Herbaceous species present may include *Schizachyrium littorale* (seacoast bluestem), *Paspalum monostachyum* (gulfdune paspalum), *Paspalum plicatulum* (brownseed paspalum), *Andropogon gerardii* (big bluestem), *Sorghastrum nutans* (Indiangrass), *Elionurus tripsacoides* (Pan American balsamscale), *Trachypogon spicatus* (crinkleawn), *Acalypha radians* (cardinal's feather), *Argythamnia mercurialina* (tall wild-mercury), *Chamaecrista flexuosa* (partridge pea), *Cnidoscolus texanus* (Texas bull-nettle), *Croton argyranthemus* (silverleaf croton), *Froelichia floridana* (Florida snake-cotton), *Galactia canescens* (hoary milkpea), *Eriogonum multiflorum* (heartsepal wildbuckwheat), *Rhynchosia americana* (American snoutbean), *Stillingia sylvatica* (queen's delight), *Helianthemum georgianum* (Georgia sunrose), *Zornia bracteata* (bracted zornia), and *Thelesperma nuecense* (Nueces greenthread). A relatively continuous shrubby understory may be dominated by species such as *Callicarpa americana* (American beautyberry) and *Malvaviscus arboreus* (Turk's cap), or the shrub layer may not be well-developed. Other woody species in the understory may include *Zanthoxylum hirsutum* (tickle-tongue), *Condalia hookeri* (brasil), *Ziziphus obtusifolia* (lotebush), *Zanthoxylum fagara* (colima), *Forestiera angustifolia* (desert olive), and *Diospyros texana* (Texas persimmon). The epiphytes *Tillandsia recurvata* (ballmoss) and *Tillandsia usneoides* (Spanish moss) are commonly encountered, with *Tillandsia bailey* (Bailey's ballmoss) less commonly found. *Vitis mustangensis* (mustang grape) is a conspicuous woody vine. In this phase, deep sand live oak woodland and forest have some woody and herbaceous species more characteristic of the south Texas plains. Most conspicuously, live oak woodland margins in the south have an open overstory co-dominated by *Prosopis glandulosa* (honey mesquite). Pothole ponds and swales accumulate water through percolation from adjacent sands, and are characterized by the presence of numerous sedges including *Cyperus* spp. (flatsedges), *Eleocharis* spp. (spikerushes), *Fimbristylis caroliniana* (Carolina fimbry), *Fuirena scirpoidea* (southern umbrellasedge), *Fuirena simplex* (western umbrellasedge), *Rhynchospora* spp. (beaksedges), *Schoenoplectus erectus* ssp. *raynalii* (sharp-scale bulrush), *Schoenoplectus saximontanus* (annual bulrush), and *Schoenoplectus pungens* var. *longispicatus* (common threesquare). Other species commonly encountered in these wetlands include *Andropogon glomeratus* (bushy bluestem), *Spartina patens* (marshhay cordgrass), *Echinodorus berteroi* (common burhead), *Hydrocotyle bonariensis* (largeleaf pennywort), *Juncus* spp. (rushes), *Mikania scandens* (climbing hemp-weed), *Nymphaea elegans* (tropical royalblue waterlily), *Phyla lanceolata* (lanceleaf frogfruit), *Sagittaria longiloba* (longlobe arrowhead), and *Typha domingensis* (southern cattail).

**VEGETATION TYPES:**

**Coastal and Sandsheet: Deep Sand Live Oak Forest and Woodland (6402)**

Texas Coastal Fringe Deep Sand Live Oak Forest and Woodland
**Identifier:** CES203.464.2 **MoRAP Code:** 6402
**Description:** This broadleaf evergreen type makes up most of the system as it is mapped and is dominated by *Quercus fusiformis* (plateau live oak) in the overstory. This constitutes the typical woodland of the system and generally conforms to the system description.

**Coastal and Sandsheet: Deep Sand Live Oak / Mesquite Woodland (6403)**

Texas Coastal Fringe Deep Sand Live Oak–Mesquite Forest and Woodland
**Identifier:** CES203.464.3 **MoRAP Code:** 6403
**Description:** *Quercus fusiformis* (plateau live oak) and *Prosopis glandulosa (*honey mesquite) share dominance in the canopy of this type. It typically occurs on the margin of live oak forest and woodland. Shrubs typical of South Texas, such as *Condalia hookeri* (brasil), *Celtis pallida* (granjeno), *Zanthoxylum fagara* (colima), *Diospyros texana* (Texas persimmon), and *Ziziphus obtusifolia* (lotebush) are also commonly encountered in this type.

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**Western Great Plains Mesquite Woodland and Shrubland**
**Identifier:** CES303.668

**Geology:** This system typically occupies Quaternary Alluvium.
**Landform:** Along drainages and low landscape positions, especially where deep soils have developed.
**Soils:** Loam, Clay Loam, and Clay Flats Ecological Sites of the northwestern portions of the Edwards Plateau.

**Description:** From the perspectives of composition and physiognomy, this system is difficult to distinguish from areas where *Prosopis glandulosa* (honey mesquite) has invaded other systems. In the context of mapping, we have limited this system to low landscape positions, particularly along drainages where significant soil accumulation has occurred. Occurrences occupy loams, clay loams, and clay flats of the northwestern portion of the Edwards Plateau where it transitions to the High Plains and Rolling Plains to the north. Sites are typically dominated by *Prosopis glandulosa* (honey mesquite), which usually forms a shrubland, but may occur as a low tree canopy (less than 8 m in height). Woodlands typically have an open aspect due to the low leaf area presented by the *Prosopis glandulosa* (honey mesquite) canopies. *Ziziphus obtusifolia* (lotebush), *Junipeus pinchotii* (redberry juniper), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), and *Berberis trifoliolata* (agarita) may be conpsicuous components of the shrub layer. The herbaceous layer is dominated by grasses such as *Pleuraphis mutica* (tobosa), *Bouteloua curtipendula* (sideoats grama), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Hilaria belangeri* (curlymesquite), *Nassella leucotricha* (Texas wintergrass), *Aristida purpurea* (purple threeawn), and *Tridens muticus* (slim tridens).

**VEGETATION TYPES:**

**High Plains: Mesquite Woodland (5404)**
**Identifier:** CES303.668.1 **MoRAP Code:** 5404
**Description:** As described for the system, but having a well-developed canopy usually greater than 4 m in height and dominated by *Prosopis glandulosa* (honey mesquite).

**High Plains: Mesquite Shrubland (5406)**
**Identifier:** CES303.668.2 **MoRAP Code:** 5406

**Description:** As described for the system, but characterized by shrubs less than 4 m in height, and/or taller and sparser overstory canopy.

## Shrublands

**Edwards Plateau Limestone Shrubland**
**Identifier:** CES303.041

**Geology:** Often on massive limestone such as Edwards or related formations.
**Landform:** This system may occur on plateaus, or slopes, and may often form a discontinuous band around a plateau edge as it breaks into the adjacent slope.
**Soils:** Soils are characterized by Shallow or Very Shallow Ecological Sites, but may also be found on other Ecological Sites, including Limestone Hill, Adobe, Low Stony Hill and Steep Rocky.

**Description:** This system may be represented by extensive continuous shrub cover, or as a patchy, discontinuous shrubland, often with scattered emergent overstory trees. *Quercus sinuata* var. *breviloba* (white shin oak), *Quercus fusiformis* (plateau live oak), and/or *Juniperus ashei* (Ashe juniper) may be important components of the system. In the west, *Pinus remota* (paper-shell pinyon) may also contribute to a scattered emergent overstory. Shrub cover may be dominated by these species, or may be represented as an assemblage of a rather diverse array of species including *Rhus virens* (evergreen sumac), *Rhus lanceolata* (prairie sumac), *Cercis canadensis* var. *texensis* (Texas redbud), *Forestiera pubescens* (elbowbush), *Forestiera reticulata* (netleaf forestiera), *Ungnadia speciosa* (Mexican buckeye), *Sophora secundiflora* (Texas mountain-laurel), *Diospyros texana* (Texas persimmon), *Salvia ballotiflora* (mejorana), *Mimosa borealis* (fragrant mimosa), *Condalia hookeri* (brasil), *Rhus trilobata* (skunkbush sumac), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), and *Mahonia trifoliolata* (agarito). This system also includes *Quercus mohriana* (Mohr's shin oak) or *Quercus vaseyana* (Vasey shin oak) dominated shrublands that are more common to the west. Herbaceous cover may be patchy and is generally graminoid, with species including *Schizachyrium scoparium* (little bluestem), *Bouteloua curtipendula* (sideoats grama), *Bouteloua rigidiseta* (Texas grama), *Bouteloua trifida* (red grama), *Hilaria belangeri* (curlymesquite), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Nassella leucotricha* (Texas wintergrass), *Erioneuron pilosum* (hairy tridens), *Aristida* spp. (threeawn), and others. Disturbances such as fire may be important processes maintaining this system. However, it appears to persist on thin-soiled sites. To the west, semi-arid conditions result in the replacement of upland woodlands with shrublands. *Juniperus pinchotii* (redberry juniper) increasingly replaces *Juniperus ashei* (Ashe juniper) in this semi-arid region, and shrubs such as *Prosopis glandulosa* (honey mesquite), *Leucophyllum frutescens* (cenizo), *Acacia berlandieri* (guajillo), *Mimosa aculeaticarpa* var. *biuncifera* (catclaw mimosa), and *Condalia viridis* (green condalia) become increasingly common. Succulents such as *Dasylirion texanum* (Texas sotol), *Nolina texana* (Texas sacahuista), and *Agave lechuguilla* (lechuguilla) also become increasingly common. In these situations, sometimes large patches are dominated by grasses such as *Bouteloua trifida* (red grama), *Bouteloua curtipendula* (sideoats grama), *Hilaria belangeri* (curlymesquite), *Eroneuron pilosum* (hairy tridens), *Tridens muticus* (slim tridens), and *Nassella leucotricha* (Texas

wintergrass). Interestingly, non-native grasses such as *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem) are less frequently encountered as dominants of occurrences in the semi-arid west, than in less xeric sites to the east. As conditions become more xeric to the west, this system transitions to shrublands more characteristic of the Chihuahuan Desert region, often with conspicuous increases in succulents such as *Dasylirion texanum* (Texas sotol), *Nolina texana* (Texas sacahuista), *Agave lechuguilla* (lechuguilla), and even *Fouquieria splendens* (ocotillo). To the south, the system transitions to the shrublands of shallow soils characteristic of the South Texas Plains, with shrubs such as *Leucophyllum frutescens* (cenizo), *Acacia berlandieri* (guajillo), and *Acacia rigidula* (blackbrush). Southern Val Verde County represents a particularly confusing mosaic of these three types.

**VEGETATION TYPES:**

**Edwards Plateau: Ashe Juniper / Live Oak Shrubland (1205)**
Edwards Plateau Limestone Evergreen Shrubland and Shrub Motte
**Identifier**: CES303.041.7 **MoRAP Code:** 1205
**Description:** This is a commonly encountered type of shrub cover on the Edwards Plateau. It is usually dominated by *Juniperus ashei* (Ashe juniper), often to the almost total exclusion of other species. If other species are present, *Quercus fusiformis* (plateau live oak), *Quercus vaseyana* (Vasey shin oak), *Quercus mohriana* (Mohr's shin oak), *Sophora secundiflora* (Texas mountain-laurel), *Mahonia trifoliolata* (agarito), and/or *Rhus virens* (evergreen sumac) contribute to the evergreen cover of this shrubland. Deciduous shrub species, including *Diospyros texana* (Texas persimmon), *Prosopis glandulosa* (honey mesquite), *Quercus sinuata* var. *breviloba* (white shin oak), and *Forestiera reticulata* (netleaf forestiera) may also be present but never dominant. Areas mapped as this system may, in some cases, lack significant cover of *Juniperus ashei* (Ashe juniper) and these sites are dominated by broad-leaved evergreen shrubs. Monotypic stands of *Quercus fusiformis* (plateau live oak) (occupying the shrub layer) are relatively uncommon. A sparse overstory canopy of *Juniperus ashei* (Ashe juniper), *Quercus fusiformis* (plateau live oak), *Pinus remota* (paper-shell pinyon), *Prosopis glandulosa* (mesquite), *Quercus sinuata* var. *breviloba* (white shin oak), *Quercus vaseyana* (Vasey shin oak), *Celtis* spp. (hackberry) or other species may sometimes be present. Where deciduous shrubs are present and shrub cover is distributed in a patchy mosaic, such sites may be used by black-capped vireos (*Vireo atricapilla*). Land use history may contribute to the extensive nature of this type in the east, while thin soils and xeric climatic conditions largely control the extent of this type to the west. The unpalatable nature of many of the evergreen shrubs in this vegetation type enhances their proliferation under heavy browsing. The majority of shrublands on the Edwards Plateau is mapped as this vegetation type.

**Edwards Plateau: Shin Oak Shrubland (1206)**
Edwards Plateau Limestone Deciduous Shrubland and Shrub Motte
**Identifier**: CES303.041.8 **MoRAP Code:** 1206
**Description:** This vegetation type represents the deciduous shrubland that may be present, usually on thin-soiled sites. *Quercus sinuata* var. *breviloba* (white shin oak) may be the significant dominant in these shrublands, sometimes forming nearly monotypic

stands. *Juniperus ashei* (Ashe juniper), *Quercus fusiformis* (plateau live oak), and other broad-leaved evergreen shrub species may be common components, but are not dominant. Scattered individuals of these species may be emergent as trees (along with other species such as *Celtis* spp. (hackberry), *Prosopis glandulosa* (mesquite), *Pinus remota* (paper-shell pinyon), *Quercus buckleyi* (Texas oak)) and form a sparse overstory canopy. Frequently, *Quercus sinuata* var. *breviloba* (white shin oak) is uncommon or lacking and other deciduous shrubs dominate. Such species as *Diospyros texana* (Texas persimmon), *Prosopis glandulosa* (honey mesquite), *Mahonia trifoliolata* (agarito), *Forestiera pubescens* (elbowbush), *Forestiera reticulata* (netleaf forestiera), *Condalia hookeri* (brasil), *Rhus trilobata* (skunkbush sumac), *Ungnadia speciosa* (Mexican buckeye), and/or *Mimosa borealis* (fragrant mimosa) may be significant components. These shrublands may be surrounded by grassland, or may transition to adjacent woodland. Where these shrublands are patchy, they may represent appropriate habitat for black-capped vireos (*Vireo atricapilla*). To the south, this shrubland may transition to vegetation more commonly encountered in the South Texas Plains, with shrub species such as *Leucophyllum frutescens* (cenizo), *Acacia berlandieri* (guajillo), *Jatropha dioica* (leatherstem), and *Salvia ballotiflora* (shrubby blue sage).

**Edwards Plateau: Ashe Juniper / Live Oak Slope Shrubland (1225)**
Edwards Plateau Limestone Evergreen Slope Shrubland
**Identifier**: CES303.041.17 **MoRAP Code:** 1225
**Description:** This shrubland resembles the Edwards Plateau: Ashe Juniper / Live Oak Shrubland, but occurs on slopes of greater than twenty percent and often occupies Steep Rocky and Steep Adobe ecoclasses. *Rhus virens* (evergreen sumac) and/or *Garrya ovata* var. *lindheimeri* (Lindheimer's silktassel) may be more commonly encountered in this vegetation type. A sparse overstory of *Juniperus ashei* (Ashe juniper) and/or *Quercus fusiformis* (plateau live oak) may be present. Southern expressions may also have shrub components such as *Acacia berlandieri* (guajillo), *Jatropha dioica* (leatherstem), *Salvia ballotiflora* (shrubby blue sage), *Ungnadia speciosa* (Mexican buckeye), and *Acacia rigidula* (blackbrush).

**Edwards Plateau: Shin Oak Slope Shrubland (1226)**
Edwards Plateau Limestone Deciduous Shrubland
**Identifier**: CES303.041.18 **MoRAP Code:** 1226
**Description:** This shrubland resembles Edwards Plateau: Shin Oak Shrubland, but occurs on slopes greater than twenty percent. As with the occurrences off of slopes, *Quercus sinuata* var. *breviloba* (white shin oak) may not be dominant. *Nolina texana* (Texas sacahuista), *Acacia roemeriana* (Roemer's acacia), *Salvia ballotiflora* (mejorana), *Ungnadia speciosa* (Mexican buckeye), and *Eysenhardtia texana* (Texas kidneywood) may be more commonly encountered on slopes than in non-slope deciduous shrublands.

**Edwards Plateau: Juniper Semi-arid Shrubland (1215)**
Edwards Plateau Limestone Semi-arid Juniper Shrubland
**Identifier:** CES303.041.19 **MoRAP Code:** 1215
**Description:** This shrubland is commonly encountered on the western portions of the Edwards Plateau and is dominated by *Juniperus pinchotii* (redberry juniper) or *Juniperus*

*ashei* (Ashe juniper) shrubs. A sparse overstory canopy of *Juniper* sp. (juniper), *Quercus fusiformis* (plateau live oak), *Pinus remota* (papershell pinyon), and/or *Prosopis glandulosa* (honey mesquite) may be present. Other shrub species commonly encountered include *Prosopis glandulosa* (honey mesquite), *Berberis trifoliolata* (agarito), *Diospyros texana* (Texas persimmon), *Leucophyllum frutescens* (cenizo), and *Acacia berlandieri* (guajillo). *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear) and *Dasylirion texanum* (Texas sotol) are commonly encountered succulents.

**Edwards Plateau: Deciduous Semi-arid Shrubland (1216)**

Edwards Plateau Semi-arid Deciduous Shrubland
**Identifier:** CES303.041.20 **MoRAP Code:** 1216
**Description:** This shrubland occurs within the more arid regions of the western portions of the Edwards Plateau. Donimant shrub species within this type include *Diospyros texana* (Texas persimmon), *Prosopis glandulosa* (honey mesquite), *Quercus vaseyana* (Vasey shin oak), *Quercus sinuata* var. *breviloba* (white shin oak), *Salvia ballotiflora* (shrubby blue sage), *Berberis trifoliolata* (agarito), *Condalia* sp. (condalia), *Sophora secundiflora* (Texas mountain-laurel), and *Acacia berlandieri* (guajillo). Succulents, including *Dasylirion texanum* (Texas sotol), *Nolina texana* (Texas sacahuista), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), and *Agave lechuguilla* (lechuguilla), are commonly encountered in the driest, rockiest situations. *Juniperus pinchotii* (redberry juniper), *Juniperus ashei* (Ashe juniper) and/or *Quercus fusiformis* (plateau live oak), may be present, but sites are dominated by deciduous shrubs.

**Edwards Plateau: Juniper Semi-arid Slope Shrubland (1235)**

Edwards Plateau Limestone Semi-arid Juniper Slope Shrubland
**Identifier:** CES303.041.21 **MoRAP Code:** 1235
**Description:** This shrubland occurs on slopes greater than 20% in the western portions of the Edwards Plateau. They are dominated by *Juniperus pinchotii* (redberry juniper) and/or *Juniperus ashei* (Ashe juniper), but often have other deciduous shrub components (see **Juniper Semi-arid Shrubland**).

**Edwards Plateau: Deciduous Semi-arid Slope Shrubland (1236)**

Edwards Plateau Limestone Semi-arid Deciduous Slope Shrubland
**Identifier:** CES303.041.22 **MoRAP Code:** 1236
**Description:** Shrublands of the western portion of the Edwards Plateau occurring on slopes greater than 20% and dominated by deciduous shrub species as described for **Deciduous Semi-arid Shrubland**.

**Edwards Plateau: Semi-arid Grassland (1207)**

**Identifier:** CES303.041.23 **MoRAP Code:** 1207
**Description:** These grasslands form the interstices of the shrubland matrix of the western portion of the Edwards Plateau, sometimes occurring as extensive areas with reduced cover of woody and succulent species (though scattered individuals of woody species of the system may be present). Grasses such as *Aristida purpurea* (purple threeawn), *Bouteloua trifida* (red grama), *Bouteloua curtipendula* (side-oats grama), *Hilaria*

*belangeri* (curlymesquite), *Erioneuron pilosum* (hairy tridens), *Tridens muticus* (slim tridens), *Nassella leucotricha* (Texas wintergrass), and/or *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem) are common dominants.

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**Tamaulipan Calcareous Thornscrub**

**Identifier:** CES301.986
**Geology:** Ridge or plateau forming hard calcareous substrates such as caliche of the Goliad Formation, Cretaceous limestone of the southern Edwards Plateau, or Uvalde Gravel.
**Landform:** Typically ridges high on the landscape, sometimes rolling or relatively level plateaus.
**Soils:** Shallow, Shallow Ridge or Gravelly Ridge Ecological Sites, among others.

**Description:** This shrubland typically occupies xeric, rocky uplands on calcareous substrates including limestone, caliche (such as those of the Goliad Formation), calcareous gravels, and calcareous sandstone of south Texas and northeastern Mexico. Soils are usually thin, and sites are most frequently dominated by shrubs between 0.5 and 2 m in height. Shrub canopy can be dense (to about 90%), or sparser where rocky exposures reduce substrate for rooting. A sparse overstory, usually <4 m in height, may be present and composed of species such as *Prosopis glandulosa* (honey mesquite) and, in the south, *Ebenopsis ebano* (Texas ebony), *Cordia boissieri* (anacahuita), and/or *Helietta parvifolia* (baretta). *Quercus fusiformis* (plateau live oak) may form a relatively open canopy in areas in the northeastern part of the South Texas Plains. The shrub layer may be heavily dominated by *Leucophyllum frutescens* (cenizo), *Acacia berlandieri* (guajillo), and/or *Acacia rigidula* (blackbrush). More commonly, a diverse array of shrubs is present, including these three in addition to several of the following species: *Salvia ballotiflora* (shrubby blue sage), *Eysenhardtia texana* (Texas kidneywood), *Guaiacum angustifolium* (guayacan), *Sophora secundiflora* (Texas mountain-laurel), *Mahonia trifoliolata* (agarito), *Ephedra antisyphilitica* (joint-fir), *Sideroxylon celastrinum* (la coma), *Jatropha dioica* (leatherstem), *Bernardia myricifolia* (oreja de raton), *Karwinskia humboldtiana* (coyotillo), *Aloysia macrostachya* (vara dulce), *Condalia spathulata* (knifeleaf condalia), *Croton incanus* (Torrey croton), *Koeberlinia spinosa* (allthorn), *Acacia schaffneri* (huisachillo), *Forestiera angustifolia* (desert olive), *Celtis ehrenbergiana* (granjeno), *Diospyros texana* (Texas persimmon), *Cylindropuntia leptocaulis* (tasajillo), *Krameria ramosissima* (calderona), *Yucca treculeana* (Spanish dagger), and others. More southerly occurrences may also contain *Lippia graveolens* (redbrush lippia), *Helietta parvifolia* (baretta), *Gochnatia hypoleuca* (chomonque), *Croton humilis* (low croton), *Ebenopsis ebano* (Texas ebony), and/or *Mortonia greggii* (afinador). The herbaceous layer may be somewhat well-developed, but often bare rock is easily visible through the layer. The herbaceous layer of many sites are now dominated by non-native grasses, particularly *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem) and/or *Pennisetum ciliare* (buffelgrass). Other grasses are often shortgrasses, with species such as *Bouteloua rigidiseta* (Texas grama), *Bouteloua hirsuta* (hairy grama), *Bouteloua dactyloides* (buffalograss), *Hilaria belangeri* (curlymesquite), *Aristida purpurea* (purple threeawn), *Bouteloua curtipendula* (sideoats grama), and *Setaria leucopila* (plains bristlegrass) present. Forbs and subshrubs are conspicuous in the herbaceous layer and include species such as *Tiquilia canescens* (oreja de perro), *Thamnosma texana* (Texas desert-rue), *Galphimia angustifolia*

(narrowleaf thryallis), *Polygala alba* (white milkwort), *Cordia podocephala* (cluster cordial) , *Acourtia runcinata* (peonia), *Dalea aurea* (golden dalea), *Calliandra conferta* (Rio Grande stickpea), *Chamaecrista greggii* (Gregg's senna), *Heliotropium torreyi* (Torrey heliotrope), *Melampodium cinereum* (blackfoot daisy), *Hymenopappus scabiosaeus* (old plainsman), *Desmanthus velutinus* (velvet bundleflower), *Calylophus hartwegii* (Hartweg evening primrose), *Simsia calva* (awnless bush sunflower), *Hermannia texana* (Mexican mallow), *Macrosiphonia lanuginosa* var. *macrosiphon* (plateau rocktrumpet), *Viguiera stenoloba* (skeletonleaf goldeneye), *Stenaria nigricans* (prairie bluets), *Thymophylla pentachaeta* (fire-hair dogweed), *Wedelia hispida* (hairy zexmania), and *Meximalva filipes* (violet sida). Down slope from these sites, soil development increases, soils tend to be tight, a more well-developed overstory of *Prosopis glandulosa* (honey mesquite) becomes prominent, and species such as *Castela erecta* (amargosa) and *Ziziphus obtusifolia* (lotebush) increase in cover relative to other species.

**VEGETATION TYPES:**

**South Texas: Shallow Shrubland (7204)**

Tamaulipan Calcareous Shrubland
**Identifier:** CES301.986.4 **MoRAP Code:** 7204
**Description:** Typical shrublands of ridges and caliche plateaus with moderate shrub cover and sometimes a sparse overstory canopy.

**South Texas: Shallow Dense Shrubland (7205)**

Tamaulipan Calcareous Dense Shrubland
**Identifier:** CES301.986.5 **MoRAP Code:** 7205
**Description:** Dense shrublands often dominated by species such as *Acacia rigidula* (blackbrush), *Leucophyllum frutescens* (cenizo), and *Acacia berlandieri* (guajillo).

**South Texas: Shallow Sparse Shrubland (7207)**

Tamaulipan Calcareous Sparse Shrubland
**Identifier:** CES301.986.7 **MoRAP Code:** 7207
**Description:** Sites on calcareous ridges and plateaus where shrub canopy is sparse. These sites are often managed pasture, with species such as *Pennisetum ciliare* (buffelgrass), *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), or *Cynodon dactylon* (Bermudagrass).

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**Tamaulipan Mixed Deciduous Thornscrub**
**Identifier:** CES301.983

**Geology:** Well-represented on the Eocene Claiborne and Jackson Groups and the Pleistocene Beaumont Formation, but also found on various other formations.
**Landform:** On gently rolling to nearly level sites, sometime interdigitated with calcareous ridges and low lying drainages and bottomlands.
**Soils:** Clay, Clay Flat, and Clay Loam Ecological Sites are the typical soils for this system, though it may occur on a variety of other tight soils.

**Description:** This shrubland is differentiated from **Tamaulipan Savanna Grassland** as it occupies tighter soils, as opposed to the sandier soils of the savanna grassland. The sites are often lower in the landscape compared to nearby savanna grassland or **Tamaulipan Calcareous Shrubland**, but would be considered uplands as they are distant from bottomland soils and drainages, and are not well-developed woodlands typical of the lowest landscape positions**.** To a large degree, all of these systems share numerous shrub species, but show subtle differences in relative dominance. However, this system generally occurs as a closed shrubland or low woodland, usually lacking a purely open herbaceous component. Soils are clays, clay loams, and clay flats and are often calcareous or alkaline to varying degrees. Some sites are highly saline, and these sites are occupied by **Tamaulipan Saline Shrubland**, but transitions between the systems may be subtle. *Prosopis glandulosa* (honey mesquite) is very often a conspicuous component of the canopy, sometimes reaching to 6 m in height. This canopy may be dense, but given the open nature of the canopy of individual *Prosopis glandulosa* (honey mesquite), significant solar radiation reaches the lower strata. *Acacia farnesiana* (huisache), *Celtis ehrenbergiana* (granjeno), *Ebenopsis ebano* (Texas ebony), and *Celtis laevigata* (sugar hackberry) may also be components of the canopy, but *Prosopis glandulosa* (honey mesquite) usually dominates. The overstory canopy may be open with only scattered emergent trees over a dense shrub layer at 1 to 3 m in height. Depending on land use history, the shrub understory may be limited to a few species such as *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), *Ziziphus obtusifolia* (lotebush), or *Celtis ehrenbergiana* (granjeno) on relatively recently cleared sites. On more mature sites, a diverse assemblage of species such as *Acacia rigidula* (blackbrush), *Castela erecta* (amargosa), *Malpighia glabra* (Barbados cherry), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), *Cylindropuntia leptocaulis* (tasajillo), *Ziziphus obtusifolia* (lotebush), *Celtis ehrenbergiana* (granjeno), *Lycium berlandieri* (Berlandier wolfberry), *Forestiera angustifolia* (desert olive), *Guaiacum angustifolium* (guayacan), *Diospyros texana* (Texas persimmon), *Amyris texana* (Texas torchwood), *Karwinskia humboldtiana* (coyotillo), *Havardia pallens* (tenaza), *Phaulothamnus spinescens* (snake-eyes), *Schaefferia cuneifolia* (desert yaupon), *Condalia hookeri* (brasil), and *Zanthoxylum fagara* (colima) may occur. *Leucophyllum frutescens* (cenizo) and *Acacia berlandieri* (guajillo) may be present, but occur as scattered individuals as opposed to dominating the aspect of the community as they do on some shallow-soiled calcareous sites. However, like some shallow-soiled calcareous sites, *Acacia rigidula* (blackbrush) may be the aspect dominant of the shrub layer. The herbaceous layer is usually fairly sparse. Currently, the herbaceous layer may actually be dense with the non-native grass *Urochloa maximum* (guineagrass). Other non-native species, such as *Pennisetum ciliare* (buffelgrass), *Cynodon dactylon* (Bermudagrass), *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), and *Dichanthelium annulatum* (Kleberg bluestem), may also be present to dominant. Native grasses, such as *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Trichloris* spp. (false Rhodes grasses), and *Pappophorum bicolor* (pink pappusgrass), may be present.

**VEGETATION TYPES:**

**South Texas: Clayey Live Oak Motte and Woodland (7002)**

Tamaulipan Clayey Live Oak Motte and Woodland
**Identifier:** CES301.983.2 **MoRAP Code:** 7002

**Description:** Sites along the northern edge of the South Texas Plains on clayey substrates where *Quercus fusiformis* (plateau live oak) dominates the overstory. The understory is often dominated by numerous shrub species.

**South Texas: Clayey Mesquite Mixed Shrubland (7004)**

Tamaulipan Clayey Mesquite Mixed Shrubland
**Identifier:** CES301.983.4 **MoRAP Code:** 7004
**Description:** Sites often with a sparse to dense overstory of *Prosopis glandulosa* (honey mesquite). Numerous shrub species occupy the understory, including but not limited to *Acacia farnesiana* (huisache), *Acacia rigidula* (blackbrush), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), and *Celtis ehrenbergiana* (granjeno).

**South Texas: Clayey Blackbrush Mixed Shrubland (7005)**

Tamaulipan Clayey Blackbrush Mixed Shrubland
**Identifier:** CES301.983.5 **MoRAP Code:** 7005
**Description:** Sites are typically dominated by a dense canopy of *Acacia rigidula* (blackbrush), but these sites often have numerous species in the canopy, including *Prosopis glandulosa* (honey mesquite), *Celtis ehrenbergiana* (granjeno), *Condalia hookeri* (brasil), and *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear). These shrublands may be tall (to 2 or more meters in height) making them resemble dense woodlands.

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**Tamaulipan Savanna Grassland**
**Identifier:** CES301.985

**Geology:** On thinner eolian sands on the western side of the South Texas Sand Sheet, and other sandy sites such as those of the Eocene sands of the Carrizo, Queen City, and Sparta Formations. Also found associated with other formations, such as Oakville Sandstone and other formations producing sandy residuum.
**Landform:** Level to gently rolling sites.
**Soils:** Sandy to sandy loam sites, such as those of Sandy, Loamy Sand, and Sandy Loam Ecological Sites.

**Description:** This system occurs on sandy soils, including sandy, sandy loam, and loamy sands. It is typically dominated by *Prosopis glandulosa* (honey mesquite) in the overstory, and the overstory may be sparse, giving the aspect of an open grassland, with scattered trees and shrubs. Or, more commonly, the system occurs as shrub-dominated patches within a grassy matrix, with an emergent canopy to about 6 or more meters in height of *Prosopis glandulosa* (honey mesquite) and sometimes other species, such as *Ebenopsis ebano* (Texas ebony) or *Celtis ehrenbergiana* (granjeno). Sometimes the overstory canopy is well-developed and would be considered woodland. These patches often coalesce to form significant expanses of shrubland. Sites with somewhat tighter soils tend to have a denser shrub stratum, while deep sands and sandy sites tend to be more open, often with sizeable areas lacking significant shrub cover and dominated by a primarily graminoid herbaceous layer. The shrub component of woody patches or shrublands is commonly dominated by species such as *Zanthoxylum fagara* (Colima),

*Condalia hookeri* (brasil), *Celtis ehrenbergiana* (granjeno), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), *Diospyros texana* (Texas persimmon), *Colubrina texensis* (Texas hogplum), *Cylindropuntia leptocaulis* (tasajillo), and *Acacia farnesiana* (huisache). *Prosopis glandulosa* (honey mesquite) is almost always present, and is often dominant to co-dominant and occupies the highest canopy position (sometimes sharing that position with few other species), sometimes to 6 m in height. Numerous other species may also occur in the shrub layer, including but not limited to *Schaefferia cuneifolia* (desert yaupon), *Mahonia trifoliolata* (agarito), *Forestiera angustifolia* (desert olive), *Lycium berlandieri* (Berlandier wolfberry), *Aloysia gratissima* (whitebrush), *Salvia ballotiflora* (shrubby blue sage), and *Ziziphus obtusifolia* (lotebush). The diversity of the shrub layer is significantly influenced by land use history, with recently cleared areas sometimes being represented by a near monoculture of *Prosopis glandulosa* (honey mesquite) in the overstory, *Pennisetum ciliare* (buffelgrass) in the herbaceous layer, and *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear) as the most conspicuous component of the shrub layer. The herbaceous layer is typically dominated by graminoids and may be quite dense (60 to 100% cover). Grasses, such as *Schizachyrium scoparium* (little bluestem), *Schizachyrium littorale* (seacoast bluestem), *Chloris cucullata* (hooded windmillgrass), *Paspalum monostachyum* (gulfdune paspalum), *Paspalum plicatulum* (brownseed paspalum), *Elionurus tripsacoides* (Pan American balsamscale), *Bouteloua rigidiseta* (Texas grama), *Urochloa ciliatissima* (fringed signalgrass), *Heteropogon contortus* (tanglehead), *Eragrostis secundiflora* (red lovegrass), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Trichloris pluriflora* (multiflower false Rhodes grass), *Aristida* spp. (threeawns), *Sporobolus cryptandrus* (sand dropseed), and/or *Dichanthelium* spp. (rosette grasses) commonly dominate or co-dominate the herbaceous layer. Forbs are also common, including species such as *Gaillardia pulchella* (Indian blanket), *Eriogonum multiflorum* (heartsepal wildbuckwheat), *Croton* spp. (croton), *Cnidoscolus texana* (Texas bull-nettle), *Aphanostephus skirrhobasis* (lazy daisy), *Rudbeckia hirta* (blackeyed Susan), *Verbesina encelioides* (cowpen daisy), *Clematis drummondii* (old man's beard), *Cynanchum barbigerum* bearded shallow-wort), *Thymophylla pentachaeta* (parralena), *Justicia pilosella* (hairy tubetongue), *Nama jamaicense* (fiddleleaf nama), *Monarda punctata* (spotted beebalm), *Palafoxia texana* (Texas palafoxia), *Florestina tripteris* (white palafoxia), *Zornia bracteata* (bracted zornia), *Croptilon divaricatum* (scratch-daisy), *Rhynchosia americana* (American snoutbean), and *Wedelia texana* (hairy zexmania), though some of these species are restricted to the sandiest sites.

## VEGETATION TYPES:

**South Texas: Sandy Live Oak Motte and Woodland (7102)**

Tamaulipan Sandy Live Oak Motte and Woodland
**Identifier:** CES301.985.2 **MoRAP Code:** 7102
**Description:** Sandy sites along the northern edge of the South Texas Plains where *Quercus fusiformis* (plateau live oak) dominates the canopy. *Prosopis glandulosa* (honey mesquite), *Celtis ehrenbergiana* (granjeno), *Zanthoxylum fagara* (colima), and various other species may dominate the understory and/or shrub layer.

**South Texas: Sandy Mesquite / Evergreen Woodland (7103)**

Tamaulipan Sandy Mesquite–Evergreen Woodland

**Identifier:** CES301.985.3 **MoRAP Code:** 7103
**Description:** Woodlands on sandy sites in the southern part of the South Texas Plains where the canopy is co-dominated by *Prosopis glandulosa* (honey mesquite) and *Ebenopsis ebano* (Texas ebony). A diverse shrub layer is often present.

**South Texas: Sandy Mesquite Woodland and Shrubland (7104)**

Tamaulipan Sandy Mesquite Woodland
**Identifier:** CES301.985.4 **MoRAP Code:** 7104
**Description:** Woodlands or shrublands on sandy substrate where *Prosopis glandulosa* (honey mesquite) and *Acacia farnesiana* (huisache) dominate the overstory. Other species, including *Celtis ehrenbergiana* (granjeno) may also occur in the canopy. A diverse shrub layer may also be present, with species such as *Diospyros texana* (Texas persimmon), *Zanthoxylum fagara* (colima), *Condalia hookeri* (brasil), *Acacia rigidula* (blackbrush), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), and others.

**South Texas: Sandy Mesquite Dense Shrubland (7105)**

Tamaulipan Sandy Mesquite Dense Shrubland
**Identifier:** CES301.985.5 **MoRAP Code:** 7105
**Description:** Dense shrublands on sandy substrates. These shrublands may have *Prosopis glandulosa* (honey mesquite) in the overstory, though the height of the upper layer is typically less than 5 m in height. Numerous other shrub species form the dense shrub canopy, often with *Acacia rigidula* (blackbrush) as a common component.

**South Texas: Sandy Mesquite Savanna Grassland (7107)**

Tamaulipan Savanna Grassland
**Identifier:** CES301.985.7 **MoRAP Code:** 7107
**Description:** Grass dominated sandy sites, sometimes with a sparse or patchy overstory of *Prosopis glandulosa* (honey mesquite) or other species. *Schizachyrium scoparium* (little bluestem), *Schizachyrium littorale* (seacoast bluestem), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), and other native species may dominate these grasslands, or non-native species such as *Cynodon dactylon* (Bermudagrass), *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), *Dichanthium annulatum* (Kleberg bluestem), *Eragrostis lehmanniana* (Lehmann lovegrass), or *Pennisetum ciliare* (buffelgrass) may dominate.

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**Tamaulipan Saline Thornscrub**

**Identifier:** Previously Undescribed System

**Geology:** Frequently associated with the Yegua Formation or the Jackson Group.
**Landform:** Gently rolling to low flats, sometimes dissected by minor drainages.
**Soils:** Most saline sites are within the Saline Clay and Saline Clay Loam Ecological Site.

**Description:** This system is an open shrubland on sites where soil salinity is particularly high on saline clays such as Montell saline clays, Maverick, and Catarina soils. Soils mapped as saline clay or saline clay loam, but where soil salinity is not extreme, will be occupied by **Tamaulipan**

**Mixed Deciduous Shrubland.** Often, **Tamaulipan Calcareous Shrubland** occurs upslope of this system. This system is often on level flats to gently rolling landscapes, and soils may have a veneer of gravel over the clay. *Prosopis glandulosa* (honey mesquite) usually forms a scattered emergent canopy less than 5 m in height, creating an overstory canopy cover of around 10%. Shrubs and subshrubs, such as *Varilla texana* (saladillo), *Castela erecta* (amargosa), *Acacia rigidula* (blackbrush), *Atriplex canescens* (four-wing saltbush), *Isocoma coronopifolia* (goldenweed), *Condalia spathulata* (knifeleaf condalia), *Jatropha dioica* (leatherstem), *Suaeda* spp. (seepweeds), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer prickly pear), *Cylindropuntia leptocaulis* (tasajillo), *Xylothamia palmeri* (South Texas ericameria), *Tiquilia canescens* (oreja de perro), and *Prosopis reptans* (tornillo), are conspicuous elements of the relatively open shrubland (20 to 70% canopy cover). Patchy grasses typify the herbaceous layer, with such species as *Hilaria belangeri* (curlymesquite), *Sporobolus pyramidatus* (whorled dropseed), *Pappophorum bicolor* (pink pappusgrass), *Bouteloua dactyloides* (buffalograss), *Bouteloua trifida* (red grama), and occasionally *Monanthochloe littoralis* (shoregrass). Forbs such as *Billieturnera helleri* (Billieweed), *Chamaesyce albomarginata* (white-lip matspurge), *Heliotropium curassavicum* (seaside heliotrope), and *Thymophylla pentachaeta* (parralena), may be present and conspicuous. Cacti are sometimes well-represented in the ground layer, including species such as *Echinocereus reichenbachii* var. *fitchii* (Fitch's hedgehog cactus), *Escobaria emskoetteriana* (Robert's foxtail-cactus), *Echinocereus enneacanthus* (pitaya), *Mammillaria heyderi* (Heyder's nipple-cactus), *Sclerocactus scheeri* (fishhook cactus), *Echinocactus texensis* (horse crippler), and *Thelocactus setispinus* (twisted rib cactus).

**VEGETATION TYPE:**

**South Texas: Salty Thornscrub (6806)**

Tamaulipan Saline Thornscrub
**Identifier:** **MoRAP Code:** 6806
**Description:** As described for system.

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**Chihuahuan Mixed Desert and Thornscrub**
**Identifier:** CES302.734

**Geology:** In Phase 4, this system occurs on gravels and Cretaceous limestones of the southwestern Edwards Plateau (including the Stockton Plateau).
**Landform:** Occupying gravel-capped ridges and gravelly slopes below limestone-capped ridges and on occasionally on limestone slopes.
**Soils:** Gravelly soils, either on ridges or slopes. It may also be found on Limestone Hill, Flagstone Hill, Shallow Divide, and Shallow Ridge Ecological Sites.

**Description:** In this phase, this ecological system occupies gravelly footslopes adjacent to limestone plateaus of the southwestern part of the Edwards Plateau and may also occur on gravelly ridges, gravel terraces adjacent to drainages, and occasionally on limestone slopes. This shrubland grades into the shrublands of the Tamaulipan region to the southeast, with species such as *Leucophyllum frutescens* (cenizo), *Acacia berlandieri* (guajillo), *Prosopis glandulosa* (honey mesquite), and *Acacia rigidula* (blackbrush) frequently present if not dominant. *Larrea*

*tridentata* (creosotebush), *Calliandra conferta* (Rio Grande stickpea), *Condalia viridis* (green condalia), *Mimosa aculeaticarpa* var. *biuncifera* (catclaw mimosa), *Yucca torreyi* (Torrey's yucca), *Agave lechugilla* (lechugilla), *Dasylirion texanum* (Texas sotol), and occasionally *Fouquieria splendens* (ocotillo) are often present to dominant and are more indicative of the Chihuhuan nature of this system. Herbaceous cover is generally low with species such as *Bouteloua trifida* (red grama), *Aristida purpurea* (purple threeawn), *Erioneuron pilosum* (hairy tridens), and *Bouteloua curtipendula* (sideoats grama).

**VEGETATION TYPE:**

**Trans-Pecos: Mixed Desert and Thornscrub (8306)**
**Identifier:** CES302.734.1 **MoRAP Code:** 8306
**Description:** As described for system.

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**Chihuahuan Succulent Desert Scrub**
**Identifier:** CES302.738

**Geology:** Typically associated with massive Cretaceous limestones of the Edwards group (in Phase 4), but may also be found on gravels.
**Landform:** Often on rocky or gravelly slopes.
**Soils:** Rocky or gravelly sites derived from limestone or calcareous gravel deposits. Shallow Ridge, Flagstone Hill, Shallow Divide, Limestone Hill, and Gravelly Ecological Sites are sometimes occupied by this system.

**Description:** This system typically occupies dry slopes with significant exposed rock (typically limestone) or gravel. Shrub species such as *Larrea tridentata* (creosotebush), *Mimosa aculeaticarpa* var. *biuncifera* (catclaw mimosa), *Mahonia trifoliolata* (agarita), and *Prosopis glandulosa* (honey mesquite) may be present, but succulents such as *Yucca torreyi* (Torrey's yucca), *Dasilirion texanum* (Texas sotol), *Agave lechugilla* (lechugilla), *Fouquieria splendens* (ocotillo), *Nolina texana* (Texas sacahuista), and *Opuntia* spp. (pricklypears) are conspicuous and are the aspect dominants. Overall cover is generally low and bare rock is easily visible in most occurrences.

**VEGETATION TYPE:**

**Trans-Pecos: Succulent Desert Scrub (8406)**
**Identifier:** CES302.738.1 **MoRAP Code:** 8406
**Description:** As described for system.

## Sparsely Vegetated

**Edwards Plateau Carbonate Glades and Barrens (not mapped)**
**Identifier**: CES303.655

**Geology:** Non-slope forming members of the Glen Rose formation, or areas of massive limestones such as Edwards Limestone.
**Landform:** Usually level to gently sloping uplands on plateau tops, or level benches between slopes in stair step topography.
**Soils:** Very shallow soils, sometimes very little soil development over rocky substrates.

**Description:** These are generally small patch occurrences with very sparse herbaceous cover, sometimes with occasional scattered shrubs. These sites generally co-occur with savannas, representing the shallowest soils sites, often on exposed or near-exposed limestone. They may occur as bands with adjacent grasslands, shrublands, or open woodlands. Herbaceous cover may include species such as *Chaetopappa bellidifolia* (hairy leastdaisy), *Evax prolifera* (rabbit's tobacco), *Croton monanthogynus* (prairie-tea), *Sedum nuttallianum* (yellow stonecrop), *Sedum pulchellum* (widowscross), *Sporobolus vaginiflorus* (poverty dropseed), *Centaurium texense* (Texas centaury), *Spermolepis inermis* (spreading scaleseed), *Chamaesyce serpens* (matted sandmat), *Heliotropium tenellum* (pasture heliotrope), *Lesquerella* spp. (bladderpod), and others.

A possible outlier (the system occurring well outside the ecoregion within which it is normally found) of this system consists of small patch occurrences of very sparse herbaceous cover found on very shallow soils over chalk outcrops in isolated locales of North Texas (Gober, Annona, Austin Chalk and Pecan Gap formation). Species include *Bouteloua rigidiseta* (Texas grama), *Sedum pulchellum* (Texas sedum), *Sporobolus vaginiflorus* (poverty dropseed), *Nostoc commune* (nostoc), *Penstemon cobaea* (white beardtongue), and *Lesquerella* spp. (bladderpod). Adjacent woodlands or savannas on thin-soiled chalk ridges may contain *Quercus shumardii* (Shumard oak), *Quercus muehlenbergii* (chinkapin oak), *Celtis* sp. (hackberry), *Cornus drummondii* (roughleaf dogweed), *Viburnum rufidulum* (rusty blackhaw), *Fraxinus texensis* (Texas ash), and others.

**Edwards Plateau Cliff**
**Identifier**: CES303.653

**Geology:** Hard-bedded limestones.
**Landform:** Vertical or near vertical rock faces, sometimes alternating with slope forming limestone members.
**Soils:** Little to no soil development. Some soil accumulating on ledges and in crevices.

**Description:** Some of these sites may be mesic, accumulating moisture from nearby slopes in crevices within the limestone substrate, and seeps may be present. They often occur as long narrow bands. Composition and cover on these cliff faces is a function of aspect, canopy cover provided by surrounding systems, local climate, and moisture available from the underlying geologic formation. Seeps and mesic sites may have fairly dense cover of *Adiantum capillus-veneris* (maiden-hair fern) with patches of *Thelypteris ovata* var. *lindheimeri* (Lindheimer's maidenfern) present. More xeric sites often have significant shrub cover, with species such as *Buddleja racemosa* (Texas butterflybush), *Ungnadia speciosa* (Mexican buckeye), *Diospyros texana* (Texas persimmon), *Ageratina havanensis* (shrubby boneset), *Garrya ovata* ssp. *lindheimeri* (Lindheimer's silktassel), *Bernardia myricifolia* (southwest bernardia), *Philadelphus* spp. (mock-orange), *Styrax* spp. (snowbell), and *Toxicodendron radicans* ssp. *eximium* (poison ivy). To the west, cliff faces become increasingly xeric, often with increasing cover of succulents such as *Dasylirion texanum* (Texas sotol) and *Agave lechuguilla* (lechuguilla). Herbaceous species that may be present include *Salvia roemeriana* (cedar sage), *Penstemon baccharifolius* (baccharisleaf beardtongue), *Schoenus nigricans* (black sedge), *Chaetopappa bellidifolia* (least daisy), *Perityle* spp. (rockdaisy), and ferns in the genera *Asplenium*, *Astrolepis*, *Cheilanthes*, and *Pellaea*. Sparse grasses including *Bouteloua hirsuta* (hairy grama), *Bouteloua rigidiseta* (Texas grama), and *Aristida oligantha* (oldfield threeawn) may be present. These cliffs often serve as refugia from herbivores.

**VEGETATION TYPES:**

**Edwards Plateau: Wooded Cliff / Bluff (806)**

Edwards Plateau Wooded Cliff / Bluff
**Identifier:** CES303.654 **MoRAP Code:** 806
**Description:** Same as system description.

**Edwards Plateau: Barren or Grassy Cliff / Bluff (807)**

Edwards Plateau Barren or Grassy Cliff / Bluff
**Identifier:** CES303.654.0 **MoRAP Code:** 807
**Description:** This vegetation type generally lacks significant vegetative cover due to the limited potential for soil development on such steep surfaces. These cliffs or bluffs may have development of some lichen and patchy grass clumps in limited areas where soil can remain stable. Sparse shrubs and herbaceous cover (with species suggested in the system description) may be present.

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**North American Warm Desert Bedrock Cliff and Outcrop**
**Identifier:** CES302.745

**Geology:** In Phase 4, this system is primarily associated with the massive lower Cretaceous limestones such as Devil's River, Segovia, Salmon Peak, and Santa Elena Limestones.
**Landorm:** Rock faces with slopes greater than 80%.
**Soils:** Very little to no soil development.

**Description:** This sparsely vegetated system occupies steep rock faces of the massive limestones of the region. Some of these cliffs may be 100's of feet tall. Vegetation is typically restricted to crevices, although crustonse lichens may be well-represented.

**VEGETATION TYPE:**

**Trans-Pecos: Cliff and Outcrop (10100)**

North American Warm Desert Bedrock Cliff and Outcrop
**Identifier:** CES.302.745.1 **MoRAP Code:** 10100
**Description:** As described for system.

## Herbaceous Vegetation

**Texas Blackland Tallgrass Prairie**
**Identifier**: CES205.684

**Geology:** Calcareous gravels of the Leona Formation and Uvalde Gravel, of limited extent in this southern portion of the range of this system.
**Landform:** Flat to gently rolling and dissected by drainages, with some significant ridges.
**Soils:** Typically Vertisols, but this system may occupy Mollisols or Alfisols in limited parts of its distribution. The system generally occurs on calcareous clays, but may also occur on loams, clay loams, or even sandy clay loams.

**Description:** Currently, only remnants of this system exist, with most of the historical distribution replaced by crop production or improved pasture. Occurrences in Phase 4 represent the southwestern most extensions of the system. *Schizachyrium scoparium* (little bluestem) is the most ubiquitous component of occurrences of this system. *Andropogon gerardii* (big bluestem) and *Sorghastrum nutans* (Indiangrass) are also common dominants. Other species commonly encountered include *Bouteloua curtipendula* (sideoats grama), *Carex microdonta* (smalltooth sedge), *Sporobolus compositus* (tall dropseed), *Nassella leucotricha* (Texas wintergrass), *Bothriochloa laguroides* spp. t*orreyana* (silver bluestem), *Eriochloa sericea* (silky cupgrass), *Paspalum floridanum* (Florida paspalum), and *Tridens strictus* (longspike tridens). Forbs commonly encountered in this system include *Symphyotrichum ericoides* (heath aster), *Stenaria nigricans* var. *nigricans* (prairie bluets), *Helianthus maximiliani* (Maximilian sunflower), *Rudbeckia hirta* (blackeyed Susan), *Bifora americana* (prairie bishop), *Acacia angustissima* var. *hirta* (prairie acacia), *Desmanthus illinoensis* (Illinois bundleflower), and many more. Perhaps more commonly encountered species include *Croton monanthogynus* (doveweed), *Amphiachyris dracunculoides* (annual broomweed), and *Asclepias* spp. (milkweeds). Lowland sites and swales are often dominated by *Tripsacum dactyloides* (eastern gamagrass) and *Panicum virgatum* (switchgrass).

**VEGETATION TYPE:**

**Blackland Prairie: Disturbance or Tame Grassland (207)**

Texas Blackland Tallgrass Disturbance or Tame Grassland
**Identifier:** CES205.684.9 **MoRAP Code: 207**
**Description:** Very little intact Blackland prairie remains within the region, so grasslands that are mapped in the region are assumed to primarily consist of disturbance or tame grasslands. Non-native grasses such as *Cynodon dactylon* (Bermudagrass), *Panicum coloratum* (kleingrass), *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem) and *Sorghum halepense* (Johnsongrass) are frequently encountered. Weedy forbs such as *Ambrosia psilostachya* (western ragweed) and *Amphiachyris dracunculoides* (common broomweed) are often present. *Prosopis glandulosa* (honey mesquite) or *Acacia*

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*farnesiana* (huisache) are often present and may be fairly dense. Important native grasses may include *Schizachyrium scoparium* (little bluestem), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Sorghastrum nutans* (Indiangrass), *Nassella leucotricha* (Texas wintergrass), *Bouteloua hirsuta* (hairy grama), and *Aristida* spp. (threeawn species).

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**Central Mixedgrass Prairie**
**Identifier**: CES303.659
**Geology:** Found within the matrix of Cretaceous limestones of the northwestern Edwards Plateau, but typically in sites where downslope soil accumulation has occurred.
**Landform:** Gently rolling, occupying lower landscape postitions where deeper soil accumulations have occurred.
**Soils:** Generally on loams and clay loams. In this phase, this system occupies Clay Loam Ecological Site.

**Description:** Central Mixedgrass Prairie represents the common prairie type in the Rolling Plains. This prairie is typically dominated by species such as *Bouteloua curtipendula* (sideoats grama), *Hilaria belangeri* (curlymesquite), *Bouteloua hirsuta* (hariy grama), *Bouteloua gracilis* (blue grama), *Buchloe dactyloides* (buffalograss), *Schizachyrium scoparium* (little bluestem), *Pascopyrum smithii* (western wheatgrass), *Pleuraphis mutica* (tobosa), and *Nassella leucotricha* (Texas wintergrass) also commonly encountered. Grazing tends to favor shortgrass species such as *Buchloe dactyloides* (buffalograss) and *Bouteloua gracilis* (blue grama). This system is frequently invaded by *Juniperus pinchotii* (redberry juniper), *Juniperus ashei* (Ashe juniper), *Mahonia trifoliolata* (agarito), and/or *Prosopis glandulosa* (mesquite).

**VEGETATION TYPE:**

**Rolling Plains: Mixedgrass Prairie (307)**

Central Mixed Grass Prairie
**Identifier:** CES303.659.9 **MoRAP Code:** 307
**Description:** As described for system.

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**Chihuahuan – Sonoran Desert Bottomland and Swale Grassland**
**Identifier:** CES302.746

**Geology:** Typically on Quaternary alluvium, but may be local in nature and mapped within various geological formations.
**Landform:** Generally found on local topographic lows that may be associated with a drainage or may occur as basins or swales.
**Soils:** Found on tight soils, typically Clay Flat Ecological Sites.

**Description:** This system is named based on the regions (Chihuahuan and Sonoran Deserts) where it is best developed and occupies significant areas, however it does occur well outside

these regions, at least as far north and east as the Rolling Plains of Texas. The system typically occurs in local topographic lows that may be associated with drainages, or may represent swales or basins, and typically receives run-off from the surrounding landscape. Soils are generally clayey, and in some cases the shrink-swell characteristics of the soil may limit the development of woody species. *Pleuraphis mutica* (tobosa) is generally the clear dominant, though other species such as *Panicum obtusum* (vine-mesquite), *Sporobolus airoides* (alkali sacaton), and *Pascopyrum smithii* (western wheatgrass) may be present. *Prosopis glandulosa* (mesquite) may be present, and in some cases may develop into a significant canopy. The system often occupies the Clay Flat Ecological Site.

**VEGETATION TYPE:**

**Southwest: Tobosa Grassland (407)**

Chihuahuan – Sonoran Desert Bottomland and Swale Grassland (Tobosa Swales)
**Identifier:** CES302.746.9 **MoRAP Code:** 407
**Description:** As described for system.

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**East-Central Texas Plains Xeric Sandyland**
**Identifier**: CES205.897
**Geology:** Associated with Eocene sand formations, in particular Carrizo Sands in Phase 4.
**Landform:** High topographic positions, along with rapidly draining soils, results in conditions that only briefly retain surface moisture.
**Soils:** Deep sands typify this system.

**Description:** This small patch system is typically an open, herbaceous-dominated sand "prairie," sometimes with open, oak-dominated woodlands. Phase 4 is at the extreme southwest extent of the range of this system, with many of the characteristic woody species such as *Quercus incana* (bluejack oak), *Quercus margarettae* (sand post oak), *Quercus stellata* (post oak), and *Carya texana* (black hickory) absent in occurrences within this phase. *Prosopis glandulosa* (honey mesquite) is the more common woody component in this phase. The herbaceous layer may be sparse, often with exposed sand, *Cladonia* spp. (foliose lichens), and species such as *Aristida desmantha* (curly threeawn), *Brazoria truncata* (bluntsepal brazoria), *Cnidoscolus texanus* (Texas bull-nettle), *Dichanthelium* spp. (rosette grass), *Sporobolus junceus* (pineywoods dropseed), *Lechea* spp. (pinweed), *Loeflingia squarrosa* (spreading loeflingia), *Paronychia drummondii* (Drummond nailwort), *Schizachyrium scoparium* (little bluestem), *Monarda punctata* (spotted beebalm), *Senecio ampullaceus* (Texas groundsel), *Tetragonotheca repanda* (showy nerve-ray), *Gaillardia amblyodon* (maroon gaillardia), *Rhynchosia americana* (American snoutbean), *Tephrosia lindheimeri* (Lindheimer goat-rue), *Zornia bracteata* (bracted zornia), and *Triplasis purpurea* (purple sandgrass).

**VEGETATION TYPES:**

**Post Oak Savanna: Sandylands Woodland and Shrubland (706)**

East-central Texas Plains Xeric Sandyland Woodland and Shrubland
**Identifier:** CES205.897.6 **MoRAP Code:** 706

**Description:** As described for the system, but overstory dominated by *Prosopis glandulosa* (honey mesquite). This may be a common condition, especially where fire is excluded.

**Post Oak Savanna: Sandylands Grassland (707)**

East-central Texas Plains Xeric Sandyland Herbaceous Vegetation
**Identifier:** CES205.897.9 **MoRAP Code:** 707
**Description:** As described for the system, but lacking significant woody component. This vegetation type is representative of the system in good condition, with a fire cycle more consistent with the presumed natural cycle.

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**Texas-Louisiana Coastal Prairie**

**Identifier:** CES203.550

**Geology:** This system is generally coincident with the distribution of the Pleistocene Beaumont and Lissie Formations.

**Landform**: Usually on level to gently rolling landscapes, with slopes generally less than 5%. Microtopography plays an important role in local variation in the system, with ridges, swales, mounds, depressions, mima (or pimple) mounds, and gilgai leading to a mosaic of drier and wetter plant communities.

**Soils:** Non-saline Vertisols, Alfisols, and (less extensively) Mollisols. Vertisols are often characterized by gilgai, resulting from shrink-swell attributes of the montmorillonitic clays of which they are composed. The Alfisols have a loamy surface with clayey subsoils.

**Description:** This mid- to tallgrass prairie occupies Pleistocene surfaces of the Texas and Louisiana coast, on non-saline soils of level to gently rolling topography. It is dominated by graminoid species, such as *Schizachyrium scoparium* (little bluestem), *Sorghastrum nutans* (Indiangrass), *Paspalum plicatulum* (brownseed paspalum), *Panicum virgatum* (switchgrass), *Andropogon gerardii* (big bluestem), *Sporobolus compositus* (tall dropseed), *Paspalum setaceum* (thin paspalum), *Fimbristylis puberula* (hairy fimbry), *Dichanthelium oligosanthes* (fewflower panicgrass), *Rhynchospora* spp. (beaksedges), *Paspalum floridanum* (Florida paspalum), *Muhlenbergia capillaris* (Gulf muhly), *Tridens strictus* (longspike tridens), *Bouteloua curtipendula* (sideoats grama), *Andropogon glomeratus* (bushy bluestem), and *Tripsacum dactyloides* (eastern gamagrass). *Axonopus* spp. (carpetgrasses), *Sporobolus indicus* (rat-tail smutgrass), *Andropogon virginicus* (broomsedge bluestem), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), and *Nassella leucotricha* (Texas wintergrass) may be particularly noticeable on over-grazed sites. Non-native graminoids that may be conspicuous to dominant components include *Cynodon dactylon* (Bermudagrass), *Cyperus entrerianus* (deep-rooted sedge), *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), *Dichanthium* spp. (old world bluestems), *Lolium perenne* (Italian ryegrass), *Schedonorus phoenix* (tall fescue), *Paspalum notatum* (bahiagrass), and *Paspalum dilatatum* (dallisgrass). Forbs that may often be encountered include *Liatris* spp. (gayfeathers), *Sabatia campestris* (meadow pink), *Ambrosia psilostachya* (western ragweed), *Euphorbia bicolor* (snow-on-the-prairie), *Solidago* spp. (goldenrods), *Rudbeckia hirta* (blackeyed Susan), *Ruellia humilis* (low wild petunia), *Asclepias viridis* (green milkweed), *Chamaecrista fasciculata* (partridge pea), *Helianthus angustifolius*

(narrowleaf sunflower), *Euthamia* spp. (goldentops), *Ratibida columnifera* (Mexican hat), *Symphyotrichum ericoides* (heath aster), *Silphium laciniatum* (compassplant), *Baptisia* spp. (wild indigos), *Iva angustifolia* (narrowleaf sumpweed), *Eryngium yuccifolium* (button snakeroot), *Boltonia diffusa* (smallhead doll's daisy), and *Neptunia lutea* (yellow neptunia). Woody species may invade this typically herbaceous vegetation, including *Rosa bracteata* (Macartney rose), *Acacia farnesiana* (huisache), *Triadica sebifera* (Chinese tallow), *Baccharis halimifolia* (baccharis), *Celtis laevigata* (sugar hackberry), and *Prosopis glandulosa* (honey mesquite).

**VEGETATION TYPE:**

**Gulf Coast: Coastal Prairie (5207)**

Texas-Louisiana Coastal Prairie
**Identifier:** CES203.550 **MoRAP Code:** 5207
**Description:** As described for system.

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**Texas Saline Coastal Prairie**

**Identifier:** CES203.543
**Geology:** Principally on the Pleistocene Beaumont Formation.
**Landform:** Mostly level or very gently undulating landform, typically near the coast. These sites may be inundated by saltwater during storm surges. Pimple mounds may lend some local topographic variation to the otherwise level surface.
**Soils:** Very deep, somewhat poorly to poorly drained with high salinity and/or sodicity, at least at some depth. These may be loams or clays. These soils may be saturated from local rainfall or, occasionally from storm surges.

**Description:** This system occupies saline soils, generally near-coast, on level topography of the Beaumont Formation. Sites may be nearly monotypic stands of *Spartina spartinae* (Gulf cordgrass). Other gramimoids that may be present to abundant include *Schizachyrium scoparium* (little bluestem), *Andropogon glomeratus* (bushy bluestem), *Panicum virgatum* (switchgrass), *Muhlenbergia capillaris* (Gulf muhly), or *Sporobolus indicus* (rat-tail smutgrass). *Spartina patens* (marshhay cordgrass), *Aristida oligantha* (oldfield threeawn), *Paspalum hartwegianum* (Hartweg paspalum), *Sporobolus virginicus* (seashore dropseed), *Paspalum vaginatum* (seashore paspalum), and *Distichlis spicata* (saltgrass) may be common, particularly on lower, somewhat wetter sites. Forbs are generally uncommon, but may include species such as *Borrichia frutescens* (sea ox-eye daisy), *Solidago sempervirens* (seaside goldenrod), *Iva angustifolia* (narrowleaf sumpweed), *Euthamia* spp. (goldentops), or other species more common to the non-saline soils nearby, or the salt marsh that may also be nearby. Microtopographic highs in the form of pimple mounds often have species more characteristic of less saline adjacent habitats. Shrubby species may invade the prairie, commonly including species such as *Iva frutescens* (shrubby sumpweed), *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), *Lycium carolinianum* (Carolina wolfberry), *Tamarix* sp. (saltcedar), and *Baccharis halimifolia* (baccharis).

**VEGETATION TYPES:**

**Gulf Coast: Salty Prairie (2207)**

Texas Saline Herbaceous Coastal Prairie
**Identifier:** CES203.543.7 **MoRAP Code:** 2207
**Description:** Occurrences of the system lacking significant shrub cover.

**Gulf Coast: Salty Shrubland (2206)**

Texas Saline Shrub Coastal Prairie
**Identifier:** CES203.543.6 **MoRAP Code:** 2206
**Description:** Occurrences of the system where shrubs, such as those listed above, have dominated the site.

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**Texas Saline Inland Prairie**

**Identifier:** Previously Undescribed System

**Geology:** This system often occurs on Quaternary alluvium, sometimes juxtaposed with Eocene deposits of the Jackson Group or Yegua Formation.
**Landform:** Relatively level sites, typically within floodplains.
**Soils:** Soils are often mapped as the Salty Prairie Ecological Site type.

**Description:** This typically herbaceous system occupies soils of relatively high salinity. In contrast to **Texas Saline Coastal Prairie**, soil salinity of sites occupied by this system result from deposition of salts from the surrounding landscape into alluvial sites where repeated flooding and evaporation bring salts to the surface. *Spartina spartinae* (Gulf cordgrass) typically dominates these sites, sometimes to the near exclusion of other species. Other species that may be encountered include *Sporobolus virginicus* (seashore virginicus), *Distichlis spicata* (saltgrass), *Monanthochloe littoralis* (shoregrass), *Paspalidium geminatum* (Egyptian paspalidium), *Chloracantha spinosa* (spiny aster), *Coreopsis tinctoria* (plains coreopsis), *Heliotropium curassavicum* (seaside heliotrope), *Isocoma drummondii* (Drummond goldenweed), *Borrichia frutescens* (sea ox-eye daisy), and *Helianthus ciliaris* (blue-weed). Shrubs such as *Prosopis glandulosa* (honey mesquite), *Prosopis reptans* (tornillo), *Lycium carolinianum* (Carolina wolfberry), and *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear) may be present. Occasionally shrubs, particularly *Prosopis glandulosa* (honey mesquite), may gain sufficient cover to be mapped as a shrubland. Dense stands of *Chloracantha spinosa* (spiny aster), *Isocoma drummondii* (Drummond goldenweed), or *Borrichia frutescens* (sea ox-eye daisy) may also be mapped as shrubland, and these sites may also have a sparse overstory of *Prosopis glandulosa* (honey mesquite).

**VEGETATION TYPES:**

**Inland: Salty Prairie (2407)**

Texas Saline Inland Prairie
**Identifier:** **MoRAP Code:** 2407
**Description:** This is the typical herbaceous type often dominated by *Spartina spartinae* (Gulf cordgrass).

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**Texas Coast Dune and Coastal Grassland**

**Identifier:** CES203.465

**Geology:** Eolian deep sands and Pleistocene barrier island and beach deposits of the Beaumont formation. This includes deep sands well inland on the South Texas Sand Sheet.

**Landform:** Primary and secondary dunes, as well as relatively level areas, on the mainland where deep sands are deposited. Significant local topography, in the form of swales and pothole wetlands, may be present but are excluded from this system. But, significant surface drainages are generally scarce.

**Soils:** Deep or coastal sands.

**Description:** This system includes upland, grass-dominated vegetation on deep sands. Dunes, especially those adjacent to the Gulf of Mexico, are often dominated by *Uniola paniculata* (sea oats), with other species such as *Croton punctatus* (Gulf croton), *Panicum amarum* (bitter panicum), *Ipomoea pes-caprae* (goat-foot morning-glory), *Ipomoea imperati* (beach morning-glory), *Tidestromia lanuginosa* (wooly tidestromia), *Cakile* spp. (searocket), and *Sesuvium portulacastrum* (shoreline seapurslane) also present. Upland grasslands are often dominated by *Schizachyrium littorale* (seacoast bluestem) and *Paspalum monostachyum* (gulfdune paspalum). Numerous other species, such as *Sorghastrum nutans* (Indiangrass), *Paspalum plicatulum* (brownseed paspalum), *Muhlenbergia capillaris* (Gulf muhly), *Cenchrus spinifex* (common sandbur), *Elionurus tripsacoides* (Pan American balsamscale), *Eragrostis secundiflora* (red lovegrass), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Heteropogon contortus* (tanglehead), *Andropogon glomeratus* (bushy bluestem), *Spartina patens* (marshhay cordgrass), and *Dichanthelium* spp. (rosette grasses) may also be common. Numerous forbs, including such species as *Heterotheca subaxillaris* (camphor weed), *Croton* spp. (crotons), *Chamaecrista fasciculata* (partridge pea), *Rayjacksonia phyllocephala* (camphor daisy), *Physalis* spp. (groundcherries), *Helianthus argophyllus* (silverleaf sunflower), *Gaillardia pulchella* (Indian blanket), *Solidago sempervirens* (seaside goldenrod), *Baptisia* spp. (wild-indigos), *Indigofera miniata* (scarlet-pea), *Eriogonum multiflorum* (heartsepal wildbuckwheat), *Conoclinium betonicifolium* (betonyleaf thoroughwort), and *Rudbeckia hirta* (blackeyed Susan) are also commonly encountered. Some woody species are found in the system, but typically make up very little cover. Cover of woody species is limited, but may include *Baccharis* spp. (baccharis), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), *Morella cerifera* (wax-myrtle), *Quercus fusiformis* (plateau live oak), and stunted *Prosopis glandulosa* (honey mesquite). Non-native woody species such as *Tamarix* spp. (salt cedars), *Schinus terebinthifolius* (Brazilian peppertree), and *Triadica sebifera* (Chinese tallow) may be present to dominant. Small areas may have sufficient woody cover to be mapped as a shrubland.

**VEGETATION TYPES:**

**Active Sand Dune (6200)**

Texas Coast Dune and Coastal Grassland Active Dune

**Identifier:** CES203.465.1 **MoRAP Code:** 6200

**Description:** These are barren to sparsely vegetated deep sands where active sand movement is occurring. These sites may sometimes be 15 m or more in height and offer the greatest degree of topographic relief in the region.

**Coastal and Sandsheet: Deep Sand Grassland (6307)**

Texas Coast Dune and Coastal Deep Sand Grassland
**Identifier:** CES203.465.7 **MoRAP Code:** 6307
**Description:** As described for herbaceous portions of the system.

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**Tamaulipan Caliche Grassland**
**Identifier:** CES301.989

**Geology:** This system occurs on sites that have a relatively thin veneer of eolian sand over caliche substrate. Such sites occur on the edge of the South Texas Sand Sheet where it overlies caliche of the Goliad Formation.
**Landform:** These grasslands occur on relatively level sites atop the Goliad formation.
**Soils:** Shallow sands and sandy loams, sometimes red sandy loams, over caliche substrate.

**Description:** This system is described from the vicinity of Loreto in Tamaulipas, Mexico, but the conditions of sand veneer over caliche outcrop may also be present on the edge of the sandsheet where it passes over the Goliad Formation in northern Hidalgo and Starr Counties. Soils are a reddish sandy loam about 0.3 m in depth or less. Such sites may currently be occupied by non-native grasses such as *Pennisetum ciliare* (buffelgrass) and *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), though invasion by these species is not observed in Mexican occurrences (Chris Best, pers. obs.). These grasslands are known to occur within a mosaic of calcareous shrublands. Johnston (1963) describes them as grassland patches (the largest of which are 50 to 100 acres in extent) within a matrix of shrubland. Grasses often dominate sites, including species such as *Schizachyrium littorale* (seacoast bluestem), *Aristida purpurea* (purple threeawn), *Bouteloua hirsuta* (hairy grama), *Elionurus tripsacoides* (Pan American balsamscale), *Trachypogon spicatus* (crinkleawn), *Heteropogon contortus* (tanglehead), *Bouteloua curtipendula* (sideoats grama), *Tridens texanus* (Texas tridens), and *Tridens muticus* (slim tridens). *Brachiaria ophryodes* and *Bouteloua radicosa* (purple grama) are also noted from occurrences in Mexico. Shrubs and sub-shrubs are scattered and sometimes coalesce into larger areas, and include species such as *Calliandra conferta* (Rio Grande stickpea), *Krameria ramosissima* (calderona), *Calliandra biflora* (twoflower stickpea), *Chamaecrista greggii* (Gregg's senna), and *Macrosiphonia lanuginosa* (plateau rocktrumpet). Perennial forbs are conspicuous and include species such as *Heliotropium confertifolium* (leafy heliotrope), *Melampodium cinereum* (blackfoot daisy), *Simsia calva* (awnless bush sunflower), *Acalypha radians* (cardinal's feather), *Cnidoscolus texanus* (Texas bull-nettle), *Galphimia angustifolia* (narrowleaf thryallis), *Hermannia texana* (Mexican mallow), *Croton capitatus* (hog croton), *Rhynchosia americana* (American snoutbean), and *Dalea nana* (dwarf dalea). Scattered shrubs that may be present include *Prosopis glandulosa* (honey mesquite), *Zanthoxylum fagara* (colima), *Cordia boissieri* (anacahuita), and *Condalia hookeri* (brasil).

**VEGETATION TYPE:**

**South Texas: Caliche Grassland (6707)**

Tamaulipan Caliche Grassland
**Identifier:** CES301.989 **MoRAP Code:** 6707

**Description:** As described for system.

## Woody Wetlands and Riparian

**Edwards Plateau Floodplain**
**Identifier**: CES303.651

**Geology:** This system usually occupies Quaternary alluvial deposits often within drainages largely underlain by Cretaceous limestones or drainages that receive outwash from landscapes dominated by these limestones.
**Landform:** Valley floors of large rivers and perennial streams. This system tends to occupy broad valley bottoms with alluvial deposits on the Edwards Plateau, and rivers and large creeks where outwash from the Edwards Plateau influences the substrate.
**Soils:** Bottomland soils of various types (Loamy, Clayey, and Sandy).

**Description:** These are forests and woodlands with a canopy dominated or co-dominated by *Carya illinoinensis* (pecan), *Ulmus crassifolia* (cedar elm), *Ulmus americana* (American elm), *Celtis laevigata* (sugar hackberry), *Celtis laevigata* var. *reticulata* (netleaf hackberry), and/or *Quercus fusiformis* (plateau live oak). *Carya illinoinensis* (pecan) may be more likely to occur in deeper and better-developed alluvial soils. Apparent dominance of *Carya illinoinensis* (pecan) may also be an artifact of preferential harvesting of other species, leaving this species in greater abundance. *Melia azedarach* (chinaberry) is a common non-native tree encountered on floodplains. Other species present may include *Fraxinus texensis* (Texas ahs), *Fraxinus pennsylvanica* (green ash), *Juglans major* (Arizona walnut), *Quercus macrocarpa* (bur oak), *Quercus buckleyi* (Texas oak), *Acer negundo* (boxelder), *Sapindus saponaria* var. *drummondii* (western soapberry), *Juniperus ashei* (Ashe juniper), *Taxodium distichum* (baldcypress), *Prosopis glandulosa* (mesquite), and *Platanus occidentalis* (American sycamore). Woody species in the subcanopy may include *Sideroxylon lanuginosum* (gum bumelia), *Ptelea trifoliata* (wafer-ash), *Cornus drummondii* (roughleaf dogwood), *Morus rubra* (red mulberry), *Diospyros texana* (Texas persimmon), *Parthenocissus quinquefolia* (Virginia creeper), *Vitis* spp. (grape), *Smilax bona-nox* (greenbrier), *Baccharis neglecta* (roosevelt-weed), *Malvaviscus arboreus* var. *drummondii* (Turk's cap), *Juniperus ashei* (Ashe juniper), and *Ilex decidua* (possumhaw). The herbaceous layer may be continuous, though relatively sparse, or patchy with species such as *Elymus virginicus* (Virginia wildrye), *Chasmanthium latifolium* (creekoats), *Nassella leucotricha* (Texas wintergrass), *Verbesina virginica* (frostweed), and *Carex* spp. (caric sedge). Some sites lack, or have very sparse, overstory canopies and represent shrublands or grasslands. Shrublands may be dominated by species in the shrub layer of the surrounding woodlands. Other components or dominants may include species such as *Prosopis glandulosa* (mesquite), *Acacia farnesiana* (huisache), *Sapindus saponaria* var. *drummondii* (western soapberry), *Juglans microcarpa* (little walnut), *Mahonia trifoliolata* (agarito), and *Cephalanthus occidentalis* (common buttonbush). Grassland sites are frequently dominated by the non-native species *Cynodon dactylon* (Bermuda grass) and/or *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem). Native species that may also be present in (and sometimes dominate) these sites include *Panicum virgatum* (switchgrass), *Andropogon glomeratus* (bushy bluestem), *Elymus virginicus* (Virginia wildrye), *Nassella leucotricha* (Texas wintergrass), *Hordeum pusillum* (little

barley), *Tripsacum dactyloides* (eastern gamagrass), *Muhlenbergia lindheimeri* (Lindheimer's muhly), *Carex* spp. (carices), and *Eleocharis* spp. (spikerushes). Floodplain occurrences often include portions that resemble Edwards Plateau Riparian vegetation, especially along stream margins, where *Platanus occidentalis* (sycamore), *Taxodium distichum* (baldcypress), *Juglans microcarpa* (little walnut), *Brickellia* spp. (brickellbush), *Cladium mariscus* ssp. *jamaicense* (saw-grass), and *Panicum virgatum* (switchgrass) are frequently encountered.

**VEGETATION TYPES:**

**Edwards Plateau: Floodplain Barrens (1000)**

Edwards Plateau Floodplain Sparsely Vegetated
**Identifier:** CES303.651.0 **MoRAP Code:** 1000
**Description:** Areas within the floodplain that may be scoured sufficiently frequently (or recent to the classification of the imagery) to preclude the development of significant vegetative cover. This will include gravel bars, sand bars, mud flats, and bare rock surfaces.

**Edwards Plateau: Floodplain Ashe Juniper Forest (1001)**

Edwards Plateau Floodplain Ashe Juniper Forest and Woodland
**Identifier:** CES303.651.1 **MoRAP Code:** 1001
**Description**: As described for system, but *Juniperus ashei* (Ashe juniper) dominates the canopy.

**Edwards Plateau: Floodplain Live Oak Forest (1002)**

Edwards Plateau Floodplain Live Oak Forest and Woodland
**Identifier:** CES303.651.2 **MoRAP Code:** 1002
**Descriptions:** As described for the system, but *Quercus fusiformis* (plateau live oak) dominates the canopy. Deciduous species can be, and frequently are, common in the canopy, but *Quercus fusiformis* (plateau live oak) clearly dominates. *Juniperus ashei* (Ashe juniper) may also be present.

**Edwards Plateau: Floodplain Hardwood / Ashe Juniper Forest (1003)**

Edwards Plateau Floodplain Mixed Deciduous-Evergreen Forest and Woodland
**Identifier:** CES303.651.4 **MoRAP Code:** 1003
**Description:** As described for the system, with a mix of deciduous and evergreen canopy species. *Quercus fusiformis* (plateau live oak) may represent the evergreen component of the canopy.

**Edwards Plateau: Floodplain Hardwood Forest (1004)**

Edwards Plateau Floodplain Deciduous Forest and Woodland
**Identifier:** CES303.651.6 **MoRAP Code:** 1004
**Description:** As described for the system, but deciduous species dominate the canopy.

**Edwards Plateau: Floodplain Ashe Juniper Shrubland (1005)**

Edwards Plateau Floodplain Ashe Juniper Shrubland
**Identifier:** CES303.651.7 **MoRAP Code:** 1005

**Description**: *Juniperus ashei* (Ashe juniper) dominated shrublands on floodplains.

**Edwards Plateau: Floodplain Deciduous Shrubland (1006)**

Edwards Plateau Floodplain Deciduous Shrubland
**Identifier:** CES303.651.8 **MoRAP Code:** 1006
**Description:** Shrublands on floodplains dominated by species in the shrub layer of the surrounding woodlands or other species such as *Prosopis glandulosa* (mesquite), *Acacia farnesiana* (huisache), *Juglans microcarpa* (little walnut), *Sapindus saponaria* var. *drummondii* (western soapberry), *Chilopsis linearis* (desert willow), *Mahonia trifoliolata* (agarito), *Salix nigra* (black willow), and *Cephalanthus occidentalis* (common buttonbush). *Ulmus crassifolia* (cedar elm), *Quercus fusiformis* (plateau live oak), and/or *Celtis laevigata* (sugar hackberry) may be present as a sparse and scattered overstory.

**Edwards Plateau: Floodplain Herbaceous Vegetation (1007)**

Edwards Plateau Floodplain Herbaceous Vegetation
**Identifier:** CES303.651.9 **MoRAP Code:** 1007
**Description:** Grasslands on floodplains, often dominated by *Cynodon dactylon* (Bermuda grass) and/or *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem). Native species that may be present, common, or dominant include *Panicum virgatum* (switchgrass), *Andropogon glomeratus* (bushy bluestem), *Elymus virginicus* (Virginia wildrye), *Nassella leucotricha* (Texas wintergrass), *Hordeum pusillum* (little barley), *Tripsacum dactyloides* (eastern gamagrass), *Muhlenbergia lindheimeri* (Lindheimer muhly), and *Chasmanthium latifolium* (creekoats). Scattered *Prosopis glandulosa* (mesquite), *Quercus fusiformis* (plateau live oak), *Celtis laevigata* (sugar hackberry), or other overstory species may be present.

**Edwards Plateau: Floodplain Herbaceous Wetland (1017)**

Edwards Plateau Floodplain Herbaceous Wetland
**Identifier:** CES303.651.10 **MoRAP Code:** 1017
**Description:** Wetlands within floodplains often dominated by *Cladium mariscus* ssp. *jamaicense* (saw-grass), *Eleocharis* spp. (spikerushes), and *Carex* spp. (carices).

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**Edwards Plateau Riparian**
**Identifier**: CES303.652

**Geology:** This system usually occupies Quaternary deposits along headwater streams. These may be alluvial or gravel deposits and are often within drainages dominated by limestone or other calcareous substrates on the Edwards Plateau or where substrate is influenced by outwash from the Edwards Plateau.

**Landform:** Riparian systems occupy small streams, either intermittent or perennial. These sites tend to be in erosional situations, as opposed to broad alluvial depositional sites of the floodplain types.

**Soils:** By definition, this system is mapped in areas upstream of significant development of bottomland soils on soil types of the surrounding uplands.

**Description:** Riparian vegetation may be characterized as woodlands, shrublands, or herbaceous vegetation. These erosional sites may be gravelly, cobbly, or rocky, and generally occupy the upper reaches of streams. Woodlands may have *Quercus fusiformis* (plateau live oak), *Platanus occidentalis* (American sycamore), *Taxodium distichum* (baldcypress), *Fraxinus texensis* (Texas ash), *Fraxinus pennsylvanica* (green ash), *Ulmus crassifolia* (cedar elm), *Celtis laevigata* (sugar hackberry) (including var. *reticulata*), *Acer negundo* (boxelder), *Prosopis glandulosa* (mesquite), *Quercus buckleyi* (Texas oak), *Juniperus ashei* (Ashe juniper), *Salix nigra* (black willow), and/or *Sapindus saponaria* (western soapberry). Shrub species that may be encountered in the understory of these woodlands (or, in some cases, may form shrublands lacking a significant overstory canopy) include *Juglans microcarpa* (little walnut), *Chilopsis linearis* (desert willow), *Baccharis* spp. (false-willow), *Salix nigra* (black willow), *Juniperus ashei* (Ashe juniper), *Sapindus saponaria* (western soapberry), *Cornus drummondii* (roughleaf dogwood), *Sophora secundiflora* (Texas mountain-laurel), *Sideroxylon lanuginosum* (gum bumelia), *Diospyros texana* (Texas persimmon), *Ungnadia speciosa* (Mexican buckeye), *Prosopis glandulosa* (mesquite), *Cephalanthus occidentalis* (common buttonbush), and/or *Aloysia gratissima* (whitebrush). Substantial patches of herbaceous cover may be present and often include species such as *Andropogon glomeratus* (bushy bluestem), *Panicum virgatum* (switchgrass), *Cladium mariscus* var. *jamaicense* (sawgrass), *Tripsacum dactyloides* (eastern gamagrass), *Setaria scheelei* (southwestern bristlegrass), *Nassella leucotricha* (Texas wintergrass), *Eleocharis* spp. (spikerush), *Brickellia* spp. (brickellbush), *Justicia americana* (American water-willow), *Hydrocotyle* spp. (water penny), and/or *Muhlenbergia lindheimeri* (Lindheimer muhly). Frequently, *Cynodon dactylon* (Bermuda grass) and/or *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem) dominate these grassland sites. *Sorghum halepense* (Johnson grass) is also a commonly encountered non-native grass. This system includes vegetation along very small streams, reaching upstream to spring heads and runs.

## VEGETATION TYPES:

### Edwards Plateau: Riparian Barrens (1400)

Edwards Plateau Riparian Sparsely Vegetated
**Identifier:** CES303.652.0 **MoRAP Code:** 1400
**Description:** Areas within riparian corridors that may be scoured sufficiently frequently (or recent to the classification of the imagery) to preclude the development of significant vegetative cover. This will include gravel bars, sand bars, mud flats, and bare rock surfaces.

### Edwards Plateau: Riparian Ashe Juniper Forest (1401)

Edwards Plateau Riparian Ashe Juniper Forest and Woodland
**Identifier:** CES303.652.1 **MoRAP Code:** 1401
**Description:** Forest or woodland on riparian sites dominated by *Juniperus ashei* (Ashe juniper). Otherwise generally fitting the description of forest or woodland occurrences of the system, with some deciduous species and *Quercus fusiformis* (plateau live oak) present in the canopy.

### Edwards Plateau: Riparian Live Oak Forest (1402)

Edwards Plateau Riparian Live Oak Forest and Woodland

**Identifier:** CES303.652.2 **MoRAP Code:** 1402
**Description:** Forest or woodland on riparian sites dominated by *Quercus fusiformis* (plateau live oak). Otherwise, this vegetation type generally fits the description of forest or woodland occurrences of the system, with some deciduous species and *Juniperus ashei* (Ashe juniper) present in the canopy.

**Edwards Plateau: Riparian Hardwood / Ashe Juniper Forest (1403)**

Edwards Plateau Riparian Hardwood / Ashe Juniper Forest
**Identifier:** CES303.652.4 **MoRAP Code:** 1403
**Description:** Forest or woodland on riparian sites co-dominated by evergreen species (*Juniperus ashei* (Ashe juniper) and/or *Quercus fusiformis* (plateau live oak)) and deciduous species as mentioned in the system description.

**Edwards Plateau: Riparian Hardwood Forest (1404)**

Edwards Plateau Riparian Deciduous Forest and woodland
**Identifier:** CES303.652.6 **MoRAP Code:** 1404
**Description:** As described for woodland or forest occurrences of the system, with deciduous species dominating the canopy.

**Edwards Plateau: Riparian Ashe Juniper Shrubland (1405)**

Edwards Plateau Riparian Ashe Juniper Shrubland
**Identifier:** CES303.652.7 **MoRAP Code:** 1405
**Description:** Shrublands on riparian sites dominated by *Juniperus ashei* (Ashe juniper).

**Edwards Plateau: Riparian Deciduous Shrubland (1406)**

Edwards Plateau Riparian Deciduous Shrubland
**Identifier:** CES303.652.8 **MoRAP Code:** 1406
**Description:** Shrublands on riparian sites dominated by one or more of the shrub species mentioned in the system description.

**Edwards Plateau: Riparian Herbaceous Vegetation (1407)**

Edwards Plateau Riparian Herbaceous Vegetation
**Identifier:** CES303.652.9 **MoRAP Code:** 1407
**Description:** Riparian sites dominated by upland herbaceous vegetation as described in the system description.

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**Central Texas Coastal Prairie River Floodplain**

**Identifier:** Previously Undescribed System

**Geology:** Typically occupying Quaternary alluvium adjacent to the Beaumont or Lissie Formations.
**Landform:** Terraces and margins of large creeks and rivers of the central coast, limited in Phase 4 the eastern edge along the coastal portion of the Nueces River.
**Soils:** Bottomland ecological site types, including loamy, clayey, and sandy sites.

**Description:** This system occupies bottomland soils along the coastal portions of the Navidad, Lavaca, Guadalupe, San Antonio, Mission, Aransas, and Nueces Rivers (and their tributaries) as they cross the prairie surface of the Lissie and Beaumont Formations. The Nueces River shares some affinity with the **Tamaulipan Floodplain** system to the south, and drainages further to the south and west of the Nueces, as well as the Nueces upstream of the prairie formations are attributed to that system. This system is characterized by a woodland and forest dominated by species such as *Celtis laevigata* (sugar hackberry), *Celtis laevigata* var. *reticulata* (netleaf hackberry), *Ulmus crassifolia* (cedar elm), *Carya illinoinensis* (pecan), *Ulmus americana* (American elm), *Prosopis glandulosa* (honey mesquite), and *Fraxinus berlandieriana* (Mexican ash) or *Fraxinus pennsylvanica* (green ash). Mixed deciduous / evergreen canopy may include *Quercus fusiformis* (plateau live oak) and *Ehretia anacua* (anacua) as significant components of the overstory. Sites dominated by *Quercus fusiformis* (plateau live oak) typically occur on less saturated sites such as slightly elevated situations. Less common species in the canopy may include *Acer negundo* (boxelder), *Gleditsia triacanthos* (honey locust), *Quercus macrocarpa* (bur oak), *Populus deltoides* (eastern cottonwood), *Platanus occidentalis* (American sycamore), *Morus rubra* (red mulberry), and *Acacia farnesiana* (huisache). Some wetter sites may be dominated by *Salix nigra* (black willow). *Acer negundo* (boxelder), *Sapindus saponaria* var. *drummondii* (western soapberry), *Ungnadia speciosa* (Mexican buckeye) and saplings of the overstory species may form a subcanopy. The shrub layer is often not well-developed, and contains species such as *Sabal minor* (dwarf palmetto), *Ilex vomitoria* (yaupon), *Diospyros texana* (Texas persimmon), *Sideroxylon lanuginosum* (gum bumelia), *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), *Condalia hookeri* (brasil), and/or *Cornus drummondii* (roughleaf dogwood). *Sabal minor* (dwarf palmetto) or *Ilex vomitoria* (yaupon) may sometimes form a dense shrub understory. Some sites may represent dense shrublands dominated by *Cephalanthus occidentalis* (common buttonbush) with a sparse overstory. Vines are commonly encountered, including species such as *Ampelopsis arborea* (peppervine), *Vitis mustangensis* (mustang grape), *Smilax bona-nox* (saw greenbrier), *Toxicodendron radicans* (poison ivy), and *Campsis radicans* (trumpet creeper). The ground layer can be well-developed and often dominated by graminoids, including *Elymus virginicus* (Virginia wildrye), *Phanopyrum gymnocarpon* (savannah panicum), *Chasmanthium latifolium* (creek oats), *Leersia* spp. (cutgrasses), *Paspalum langei* (rustyseed paspalum), *Panicum obtusum* (vine mesquite) *Tripsacum dactyloides* (eastern gamagrass), *Carex tetrastachya* Britton's sedge, *Oplismenus hirtellus* (basketgrass), and *Dichanthelium sphaerocarpon* (roundseed panicgrass). Forbs, such as *Malvaviscus arboreus* var. *drummondii* (Drummond Turk's cap), *Chloracantha spinosa* (spiny aster), *Verbesina virginica* (frostweed), *Calyptocarpus vialis* (straggler daisy), *Commelina erecta* (erect dayflower), *Allium canadense* var. *canadense* (Canada wild onion), *Myosotis macrosperma* (scorpion weed), and *Nemophila phacelioides* (baby blue-eyes) may also be found in these woodlands. *Chloracantha spinosa* (spiny aster) may sometimes form large, nearly monotypic in aspect, stands. Wetter, herbaceous dominated sites occur in these floodplains and may contain species such as *Cyperus* spp. (flatsedges), *Eleocharis* spp. (spikerushes), *Zizaniopsis miliacea* (Texas millet), *Paspalum denticulatum* (longtom), and *Typha domingensis* (southern cattail). The non-native *Triadica sebifera* (Chinese tallow) may be present to dominant in the canopy of occurrences of this system. Non-native grasses such as *Cynodon dactylon* (Bermudagrass), *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), *Urochloa maximum* (guineagrass), and *Sorghum halepense* (Johnsongrass) may also be present and sometimes dominate the ground layer to the exclusion of other species.

**VEGETATION TYPES:**

**Coastal Bend: Floodplain Live Oak Forest (4502)**

Central Texas Coastal Prairie River Floodplain Live Oak Forest and Woodland
**Identifier:** **MoRAP Code:** 4502
**Description:** As described for the system, but with the canopy dominated by *Quercus fusiformis* (plateau live oak).

**Coastal Bend: Floodplain Live Oak / Hardwood Forest (4503)**

Central Texas Coastal Prairie River Floodplain Live Oak–Hardwood Forest and Woodland
**Identifier:** **MoRAP Code:** 4503
**Description:** Forests containing a mix of deciduous and broadleaf evergreen in the canopy. Broadleaf evergreen species include *Quercus fusiformis* (plateau live oak) and *Ehretia anacua* (anacua).

**Coastal Bend: Floodplain Hardwood Forest (4504)**

Central Texas Coastal Prairie River Floodplain Deciduous Forest and Woodland
**Identifier:** **MoRAP Code:** 4504
**Description:** As described for the system with primarily deciduous hardwoods in the canopy.

**Coastal Bend: Floodplain Evergreen Shrubland (4505)**

Central Texas Coastal Prairie River Floodplain Evergreen Shrubland
**Identifier:** **MoRAP Code:** 4505
**Description:** Evergreen shrublands on floodplains with species such as *Sabal minor* (dwarf palmetto), *Rosa bracteata* (Macartney rose), *Zanthoxylum fagara* (colima), *Ehretia anacua* (anacua), *Baccharis halimifolia* (eastern baccharis), and *Acacia farnesiana* (huisache).

**Coastal Bend: Floodplain Deciduous Shrubland (4506)**

Central Texas Coastal Prairie River Floodplain Deciduous Shrubland
**Identifier:** **MoRAP Code:** 4506
**Description:** Shrublands dominated by species such as *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), *Cephalanthus occidentalis* (common buttonbush), *Forestiera acuminata* (swamp privet), and/or *Cornus drummondii* (roughleaf dogwood). Some sites mapped as this type may be dominated by *Chloracantha spinosa* (spiny aster). *Celtis laevigata* (sugar hackberry) and *Ulmus crassifolia* (cedar elm) are common within this type.

**Coastal Bend: Floodplain Grassland (4507)**

Central Texas Coastal Prairie River Floodplain Herbaceous Vegetation
**Identifier:** **MoRAP Code:** 4507

**Description:** Most sites represent managed pasture and may be dominated by species such as *Cynodon dactylon* (Bermudagrass), *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), and *Paspalum notatum* (bahiagrass).

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**Central Texas Coastal Prairie Riparian**

**Identifier:** Previously Undescribed System

**Geology:** Beaumont or Lissie Formations.

**Landform:** Upland drainages accumulating flow from surrounding, mostly level landscape. These drainages are typically erosional, sometimes incised, and rarely accrete significant alluvial deposition.

**Soils:** Various uplands soils. By definition, this system does not occupy bottomland ecological site types.

**Description:** This system represents vegetation bordering upland drainages where alluvial deposition is minimal. These sites, however, occupy locally low landscape positions and accumulate moisture from the surrounding landscape. Forested sites typically have a deciduous canopy with species such as *Celtis laevigata* (sugar hackberry), *Ulmus crassifolia* (cedar elm), *Carya illinoinensis* (pecan), *Salix nigra* (black willow), *Prosopis glandulosa* (honey mesquite), and/or *Acacia farnesiana* (huisache). *Quercus fusiformis* (plateau live oak) may share, or sometimes dominate, the canopy. The shrub layer may be well-developed and include species such as *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), *Diospyros texana* (Texas persimmon), *Condalia hookeri* (brasil), *Ziziphus obtusifolia* (lotebush), and/or *Aloysia gratissima* (whitebrush). Some areas may lack a significant overstory and be mapped as shrublands of these species. The herbaceous layer may contain species such *Elymus virginicus* (Virginia wild-rye), *Chasmanthium latifolium* (creek oats), *Calyptocarpus vialis* (straggler daisy), *Verbesina virginica* (frostweed), and *Chloracantha spinosa* (spiny aster).

**VEGETATION TYPES:**

**Coastal Bend: Riparian Live Oak Forest (4602)**

Central Texas Coastal Prairie Riparian Live Oak Forest and Woodland
**Identifier:** **MoRAP Code:** 4602
**Description:** About 12% of this system is composed of this type, where *Quercus fusiformis* (plateau live oak) or, in some cases *Ehretia anacua* (anacua), dominates the overstory.

**Coastal Bend: Riparian Live Oak / Hardwood Forest (4603)**

Central Texas Coastal Prairie Riparian Live Oak–Deciduous Forest and Woodland
**Identifier:** **MoRAP Code:** 4603
**Description:** Forests or woodlands where canopy dominance is shared by broadleaf evergreen species such as *Quercus fusiformis* (plateau live oak) or *Ehretia anacua* (anacua), and deciduous species such as *Celtis laevigata* (sugar hackberry), *Ulmus crassifolia* (cedar elm) and others.

**Coastal Bend: Riparian Hardwood Forest (4604)**

Central Texas Coastal Prairie Riparian Deciduous Forest and Woodland
**Identifier:** **MoRAP Code:** 4604
**Description:** As described for the system, where deciduous canopy species dominate a forest or woodland setting.

**Coastal Bend: Riparian Evergreen Shrubland (4605)**

Central Texas Coastal Prairie Riparian Evergreen Shrubland
**Identifier:** **MoRAP Code:** 4605
**Description:** Upland drainages where shrubs such as *Ilex vomitoria* (yaupon), *Zanthoxylum fagara* (colima), *Rosa bracteata* (Macartney rose), or *Acacia farnesiana* (huisache) dominate. *Celtis laevigata* (sugar hackberry), *Celtis ehrenbergiana* (granjeno), and *Prosopis glandulosa* (honey mesquite) are often present.

**Coastal Bend: Riparian Deciduous Shrubland (4606)**

Central Texas Coastal Prairie Riparian Deciduous Shrubland
**Identifier:** **MoRAP Code:** 4606
**Description:** Primarily disturbance shrublands of upland drainages dominated by species such as *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), small *Celtis laevigata* (sugar hackberry), *Salix nigra* (black willow), or *Cephalanthus occidentalis* (common buttonbush).

**Coastal Bend: Riparian Grassland (4607)**

Central Texas Coastal Prairie Riparian Herbaceous Vegetation
**Identifier:** **MoRAP Code:** 4607
**Description:** Sites on upland drainages that often represent managed grasslands dominated by *Cynodon dactylon* (Bermudagrass), *Paspalum notatum* (bahiagrass), or *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem).

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**Tamaulipan Floodplain**

**Identifier:** CES301.990

**Geology:** Quaternary alluvium.
**Landform:** Floodplains of rivers and large creeks where sediment is deposited. Topography is relatively level with some relief associated with levees and depressions developed from meanders of the waterway, or historical meanders of the Rio Grande (resacas).
**Soils:** Alluvial soils of the Bottomland Ecological Sites, including loamy, clayey, and sandy. The Lowland Ecological Site type also supports this system.

**Description:** This ecological system occurs along rivers and major drainages in south Texas from the central portion of the Nueces River south to northeastern Mexico and west to the vicinity of Del Rio, Texas. Generally, the system is expressed as a deciduous woodland or forest with tree height reaching to 15 meters, and canopy cover variable but sometimes reaching near 100 percent. The canopy may have a conspicuous (sometimes dominant to co-dominant) evergreen component of species such as *Ebenopsis ebano* (Texas ebony) and *Ehretia anacua*

(anacua). Dominant species of the overstory canopy often includes one or more of the following species: *Celtis laevigata* (sugar hackberry), *Ulmus crassifolia* (cedar elm), *Fraxinus berlandieriana* (Mexican ash), *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), *Diospyros texana* (Texas persimmon), *Leucaena pulverulenta* (tepeguaje), *Celtis ehrenbergiana* (granjeno), *Sapindus saponaria* var. *drummondii* (western soapberry), *Ebenopsis ebano* (Texas ebony), *Ehretia anacua* (anacua), and *Parkinsonia aculeata* (retama). In northern portions of the range of this system, particularly within the Nueces River drainage, *Carya illinoinensis* (pecan) and *Quercus fusiformis* (plateau live oak) may be conspicuous components of the overstory. Forests and woodlands may have significant shrub cover including saplings of the overstory species in addition to species such as *Zanthoxylum fagara* (colima), *Condalia hookeri* (brasil), *Forestiera angustifolia* (desert olive), *Sideroxylon* spp. (bumelias), *Aloysia gratissima* (whitebrush), *Acacia greggii* var. *wrightii* (Wright's acacia), *Malpighia glabra* (Barbados cherry), *Guaiacum angustifolium* (guayacan), *Ziziphus obtusifolia* (lotebush) and *Amyris texana* (Texas torchwood). Other shrub species, such as *Buddleja sessiliflora* (Rio Grande butterflybush), *Phaulothamnus spinescens* (snake-eyes), *Lippia alba* (white lipia), and *Amyris madrensis* (Sierra Madre torchwood) may be encountered in southern expressions of the system. *Salix nigra* (black willow) may dominate sites, especially at river's edge and wet sites. Riverbanks and other sites with a reduced overstory canopy (either from disturbance or prolonged inundation) may also be shrub dominated, often with one or few species such as *Baccharis neglecta* (Rooseveltweed), *Baccharis salicifolia* (seepwillow), *Arundo donax* (giant reed), *Sesbania drummondii* (rattlebox sesbania),and/or *Cephalanthus occidentalis* (common buttonbush). In the lower Rio Grande Valley, other shrub species such as *Salix exigua* (Texas sandbar willow), *Mimosa asperata* (black mimosa), or *Cephalanthus salicifolius* (willowleaf buttonbush) may also be present to dominant. The herbaceous layer is typically not well developed, but may include species such as *Trichloris pluriflora* (multiflower false Rhodes grass), *Setaria scheelei* (southwestern bristlegrass), *Panicum virgatum* (switchgrass), *Paspalum langei* (rustyseed paspalum), *Paspalum denticulatum* (longtom), *Carex crus-corvi* (crowfoot sedge), *Cyperus articulatus* (jointed umbrellasedge), *Rivina humilis* (pigeonberry), *Calyptocarpus vialis* (straggler daisy), *Chromolaena odorata* (cruciata), *Teucrium cubense* (Cuban germander), *Urtica chamaedryoides* (slim stinging nettle), *Parietaria pensylvanica* (cucumberweed), *Verbesina microptera* (southern frostweed), *Chloracantha spinosa* (spiny aster), *Parthenium confertum* (false ragweed), and *Malvaviscus arboreus* var. *drummondii* (Drummond Turk's cap). Vines such as *Serjania brachycarpa* (littlefruit sipple-jack), *Cocculus diversifolius* (orientvine), *Clematis drummondii* (old man's beard), and *Cissus trifoliata* (ivy treebine) are frequently encountered, and *Tillandsia usneoides* (Spanish moss) often drapes the branches of overstory species. Non-native grasses such as *Cynodon dactylon* (Bermudagrass), *Urochloa maxima* (guineagrass), *Pennisetum ciliare* (buffelgrass), *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), and *Bromus catharticus* (rescuegrass) are often present to dominant, and sometimes to the exclusion of most other herbaceous species.

## VEGETATION TYPES:

**South Texas: Floodplain Live Oak Forest and Woodland (7412)**

Tamaulipan Floodplain Live Oak Forest and Woodland
**Identifier:** CES301.990.1 **MoRAP Code:** 7412

**Description:** Floodplain forest and woodland, generally found in the Nueces River drainage and northward, and dominated by *Quercus fusiformis* (plateau live oak).

**South Texas: Floodplain Evergreen Forest and Woodland (7402)**

Tamaulipan Floodplain Evergreen Forest and Woodland
**Identifier:** CES301.990.2 **MoRAP Code:** 7402
**Description:** Forests or woodlands with the canopy dominated by broadleaf evergreen species such as *Ebenopsis ebano* (Texas ebony), *Ehretia anacua* (anacua), or, in the north *Quercus fusiformis* (plateau live oak). Deciduous species may be present, but broadleaf evergreen species clearly dominate.

**South Texas: Floodplain Mixed Deciduous / Evergreen Forest and Woodland (7403)**

Tamaulipan Floodplain Mixed Deciduous-Evergreen Forest and Woodland
**Identifier:** CES301.990.3 **MoRAP Code:** 7403
**Description:** Forests or woodlands where deciduous canopy species such as *Celtis laevigata* (sugar hackberry) and *Ulmus crassifolia* (cedar elm) share dominance with broadleaf evergreen species such as *Ebenopsis ebano* (Texas ebony) and *Ehretia anacua* (anacua).

**South Texas: Floodplain Hardwood Forest and Woodland (7404)**

Tamaulipan Floodplain Deciduous Forest and Woodland
**Identifier:** CES301.990.4 **MoRAP Code:** 7404
**Description:** Forests or woodlands with the canopy dominated by deciduous species such as *Celtis laevigata* (sugar hackberry), *Ulmus crassifolia* (cedar elm), *Celtis ehrenbergiana* (granjeno), *Prosopis glandulosa* (honey mesquite), *Leucaena pulverulenta* (tepeguaje), and *Diospyros texana* (Texas persimmon).

**South Texas: Floodplain Evergreen Shrubland (7405)**

Tamaulipan Floodplain Evergreen Shrubland
**Identifier:** CES301.990.5 **MoRAP Code:** 7405
**Description:** Dense shrublands containing species such as *Acacia farnesiana* (huisache), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), *Arundo donax* (giant reed), *Guaiacum angustifolium* (guayacan), and *Zanthoxylum fagara* (colima).

**South Texas: Floodplain Deciduous Shrubland (7406)**

Tamaulipan Floodplain Deciduous Shrubland
**Identifier:** CES301.990.6 **MoRAP Code:** 7406
**Description:** Shrublands or somewhat sparse woodlands dominated by species such as *Prosopis glandulosa* (honey mesquite), *Celtis ehrenbergiana* (granjeno), *Celtis laevigata* (sugar hackberry), *Diospyros texana* (Texas persimmon), *Parkinsonia aculeata* (retama), *Aloysia gratissima* (whitebrush), *Chloracantha spinosa* (spiny aster), and *Condalia hookeri* (brasil).

**South Texas: Floodplain Herbaceous Wetland (7417)**

Tamaulipan Floodplain Herbaceous Wetland
**Identifier:** CES301.990.17 **MoRAP Code:** 7417

**Description:** Wetlands dominated by herbaceous species such as *Schoenoplectus pungens* (common threesquare), *Cyperus articulatus* (jointed umbrellasedge), *Typha domingensis* (southern cattail), other sedges and forbs such as *Echinodorus berteroi* (common burhead).

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**Tamaulipan Ramadero**

**Identifier:** CES301.992

**Geology:** Widespread system on various geologic strata.

**Landform:** Upland drainages in various landscapes. Drainages are extremely flashy from runoff from the surrounding landscape. These sites are infrequently flooded during local rainfall events, but because they accumulate runoff, they tend to be slightly more mesic in this otherwise xeric landscape.

**Soils:** Various upland soils (not Bottomland ecological site types). Sometimes drainages are appropriately mapped specifically as Ramadero Ecological Site.

**Description:** These woodlands are found along drainages (locally known as ramaderos) that are extremely flashy and are infrequently and briefly flooded during local rain events. The soils are typically clay loams or sandy clay loams, and moisture accumulation due to their topographic position promotes the development of a closed canopy (relative to the surrounding landscape) from 5 to 10 m in height. The overstory canopy is typically dominated by species such as *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), *Celtis ehrenbergiana* (granjeno), and/or *Parkinsonia aculeate* (retama). *Celtis laevigata* (sugar hackberry) and/or *Ebenopsis ebano* (Texas ebony) may also be present in the canopy. Some sites have a relatively open subcanopy, but more commonly the shrub layer is thick, sometimes impenetrable, and varies in height from 1 to 5 m. Species commonly encountered in the shrub layer include *Aloysia gratissima* (whitebrush), *Phaulothamnus spinescens* (snake-eyes), *Celtis ehrenbergiana* (granjeno), *Condalia hookeri* (brasil), *Forestiera angustifolia* (desert olive), *Diospyros texana* (Texas persimmon), *Ziziphus obtusifolia* (lotebush), *Koeberlinia spinosa* (allthorn), *Malpighia glabra* (Barbados cherry), *Zanthoxylum fagara* (colima), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), *Guaiacum angustifolium* (guayacan), *Colubrina texensis* (Texas hogplum), and *Amyris texana* (Texas torchwood). Ground cover can be sparse, or in more open stands, may have a fairly continuous grassy cover. Species encountered in the herbaceous layer include *Clematis drummondii* (old man's beard), *Parietaria pensylvanica* (cucumberweed), *Salvia coccinea* (tropical sage), *Calyptocarpus vialis* (straggler daisy), *Rivina humilis* (pigeonberry), *Malvastrum americanum* (Rio Grande false-mallow), *Ruellia* sp. (wild petunia), and *Verbesina microptera* (southern frostweed). Grasses include *Trichloris pluriflora* (multiflower false Rhodes grass), *Bothriochloa barbinodis* (cane bluestem), *Bouteloua curtipendula* (sideoats grama), *Setaria scheelei* (southwestern bristlegrass), *Setaria macrostachya* (bigstem bristlegrass), *Setaria leucopila* (plains bristlegrass), *Chloris cucullata* (hooded windmillgrass), *Digitaria californica* (Arizona cottontop), *Pappophorum bicolor* (pink pappusgrass), *Bouteloua trifida* (red grama), *Bouteloua dactyloides* (buffalograss), and *Hilaria belangeri* (curlymesquite). The introduced grasses *Pennisetum ciliare* (buffelgrass), *Urochloa maximum* (guineagrass), and *Cynodon dactylon* (Bermudagrass) often dominate these sites,

sometimes to the near exclusion of other herbaceous cover. This system may merge downstream with the Tamaulipan Floodplain system.

**VEGETATION TYPES:**

**South Texas: Ramadero Evergreen Woodland (7602)**

Tamaulipan Ramadero Evergreen Woodland
**Identifier:** CES301.992.2 **MoRAP Code:** 7602
**Description:** Less than three percent of this system as it is mapped is occupied by this type which has a significant broadleaf evergreen component, often *Ebenopsis ebano* (Texas ebony) or *Ehretia anacua* (anacua), but sometimes *Quercus fusiformis* (plateau live oak) in the northern part of the South Texas Plains.

**South Texas: Ramadero Woodland (7604)**

Tamaulipan Ramadero Woodland
**Identifier:** CES301.992.4 **MoRAP Code:** 7604
**Description:** Woodlands 5 to 10 m in height, with a canopy typically dominated or co-dominated by *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), *Celtis ehrenbergiana* (granjeno), *Parkinsonia aculeata* (retama), and/or *Celtis laevigata* (sugar hackberry). The shrub layer is often well-developed.

**South Texas: Ramadero Dense Shrubland (7605)**

Tamaulipan Ramadero Dense Shrubland
**Identifier:** CES301.992.5 **MoRAP Code:** 7605
**Description:** Dense shrublands occupying drainages, with canopy cover reaching near 100% from 0.5 to 3 m in height. These shrublands may be dominated by numerous species. *Aloysia gratissima* (whitebrush) may sometimes form dense stands in these sites.

**South Texas: Ramadero Shrubland (7606)**

Tamaulipan Ramadero Shrubland
**Identifier:** CES301.992.6 **MoRAP Code:** 7606
**Description:** Typical shrublands along drainages making up the majority of the system. These sites are dominated by a suite of shrub species including, but not limited to, *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), *Celtis ehrenbergiana* (granjeno), *Diospyros texana* (Texas persimmon), and *Ziziphus obtusifolia* (lotebush).

**South Texas: Ramadero Herbaceous Wetland (7412)**

Tamaulipan Ramadero Herbaceous Wetland
**Identifier:** CES301.992.7 **MoRAP Code:** 7412
**Description:** Wetlands within the riparian corridor, frequently dominated by herbaceous species such as *Schoenoplectus pungens* (common threesquare), *Cyperus articulatus* (jointed umbrellasedge), *Typha domingensis* (southern cattail), other sedges and forbs such as *Echinodorus berteroi* (common burhead).

**Tamaulipan Closed Depression Wetland**

**Identifier:** CES301.197

**Geology:** This system occurs over various geologic formations, from eolian sands, to the Lissie Formation, to the Goliad Formation. Occurrences are local and appear to be unrelated to underlying strata.

**Landform:** Local, internally draining basins or depressions.

**Soils:** Though this sytem may occur in a matrix of sandy substrate, the depressions that characterize it are typically lined by clays or clay loams. Lakebed Ecological Sites typify the occurrences.

**Description:** This system occupies small, internally drained basins occurring over various substrates, but concentrated over the Lissie and Goliad Formations and the South Texas Sandsheet south of the Nueces River. They may be locally referred to as potholes, lagunas, lagunitas, ponds, or copitas. These basins are typically lined by clay or clay loam soils which tend to hinder drainage, resulting in moist conditions over extended periods. Characteristic woody species surrounding these basins include *Acacia farnesiana* (huisache), *Parkinsonia aculeata* (retama), and *Prosopis glandulosa* (honey mesquite) which make up a relatively sparse woodland canopy at a height of about 6 m. *Celtis laevigata* (sugar hackberry), *Celtis ehrenbergiana* (granjeno), and *Ulmus crassifolia* (cedar elm) may sometimes be present. Shrubs of these species, and other species such as *Condalia hookeri* (brasil), *Lycium carolinianum* (Carolina wolfberry), *Heimia salicifolia* (hachinal), and *Sideroxylon celastrina* (la coma) may be present but typically do not occur as a dense shrub layer. *Sesbania drummondii* (rattlebox sesbania) is often encountered particularly in areas with reduced woodland canopy where water may stand for extended periods. The herbaceous layer winthin the woodland may commonly contain species such as *Urochloa maxima* (guineagrass), *Chloracantha spinosa* (spiny aster), *Clematis drummondii* (old man's beard), and *Teucrium cubense* (Cuban germander). Toward the center of the basin, woody cover is reduced or often absent and the herbaceous layer is often dominated by *Cynodon dactylon* (bermudagrass), but may also be characterized by a number of sedge species of the genera *Eleocharis* (including species such as *Eleocharis quadrangulata* (squarestem spikesedge) and *Eleocharis palustris* (bigstem spikesedge)) and *Cyperus* (including species such as *Cyperus articulatus* (jointed umbrellasedge), *Cyperus acuminatus* (taperleaf flatsedge), and *Cyperus squarrosus* (bearded umbrellasedge)), as well as *Schoenoplecuts saximontanus* (annual bulrush). Numerous other species may be present, including *Paspalum distichum* (knotgrass), *Setaria parviflora* (knotroot bristlegrass), *Eragrostis spicata* (spike lovegrass), *Calyptocarpus vialis* (straggler daisy), *Eryngium nasturtiifolium* (hierba del sapo), *Eclipta prostrata* (yerba de tajo), *Phyla nodiflora* (common frog-fruit), *Soliva mutisii* (Mutis' burrweed), *Rorippa teres* (tansyleaf yellowcress), *Lindernia dubia* (moistbank pimpernel), *Rotala ramosior* (tooth-cup), *Bacopa rotundifolia* (disc waterhyssop), *Heteranthera limosa* (blue mudplantain), *Echinodorus berteroi* (common burhead), *Echinodorus tenellus* (mudbabies), *Sagittaria longiloba* (longlobe arrowhead), *Nymphaea elegans* (tropical royalblue waterlily), *Marsilea macropoda* (bigfoot water-clover), *Lemna* sp. (duckweed) and *Wolffia* sp. (watermeal).

**VEGETATION TYPES:**

**South Texas: Pond and Laguna Woodland (10004)**

**Identifier:** CES301.197.1 **MoRAP Code:** 10004
**Description:** Woodlands to a height of 6 m, or slightly higher, usually dominated by *Acacia farnesiana* (huisache) and *Parkinsonia aculeata* (retama) surrounding internally draining basins.

**South Texas: Pond and Laguna Shrubland (10006)**

**Identifier:** CES301.197.2 **MoRAP Code:** 10006
**Description:** Shrublands surrounding internally draining basins which are dominated by low stature *Acacia farnesiana* (husiache), *Parkinsonia aculeata* (retama), and species such as *Lycium carolinianum* (Carolina wolfberry), *Celtis ehrenbergiana* (granjeno), and *Sesbania drummondii* (rattlebox sesbania).

**South Texas: Pondshore Herbaceous Vegetation (10007)**

**Identifier:** CES301.197.3 **MoRAP Code:** 10007
**Description:** Area directly surrounding the basin transitioning from species such as *Cynodon dactylon* (bermudagrass) and *Calyptocarpus vialis* (straggler daisy) at the drier edges of the basin to floating species such as *Lemna* sp. (duckweed) and *Nymphaea elegans* (tropical royalblue waterlily) in basins that hold water for extended periods.

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**Rio Grande Delta Thorn Woodland and Shrubland**

**Identifier:** Not yet described

**Geology:** Quaternary alluvium.
**Landform:** Sites within the historic floodplain of the Rio Grande delta, typically on slight rises such as old natural levees or resaca banks.
**Soils:** Often on Clayey or Loamy Bottomland Ecological Sites, but occasionally on Clay Loam or Gray Sandy Loam types.

**Description:** This diverse, usually broad-leaved evergreen, woodland is found on resaca banks and old natural levees on the Rio Grande delta. Sites are well-watered, somewhat elevated relative to the surrounding landscape, and tend to occupy loamy or clayey bottomland soils. Occasionally occurrences can be found on clay loams (such as Raymondville or Racombes soils) or gray sandy loams (such as Hidalgo sandy clay loam). The sometimes patchy canopy of these woodlands often contains species such as *Ebenopsis ebano* (Texas ebony), *Ehretia anacua* (anacua), *Celtis laevigata* (sugar hackberry), *Ulmus crassifolia* (cedar elm), and *Celtis ehrenbergiana* (granjeno), and may reach heights of 15 m. Species such as *Phaulothamnus spinescens* (snake-eyes), *Amyris madrensis* (Sierra Madre torchwood), *Amyris texana* (Texas torchwood), *Diospyros texana* (Texas persimmon), *Leucaena pulverulenta* (tepeguaje), *Guaiacum angustifolium* (guayacan), *Malpighia glabra* (Barbados cherry), *Adelia vaseyi* (Vasey's adelia), *Bernardia myricifolia* (oreja de raton), *Sideroxylon celastrinum* (la coma), *Condalia hookeri* (brasil), *Forestiera angustifolia* (desert olive), *Havardia pallens* (tenaza), *Iresine palmeri* (Palmer's bloodleaf), *Trixis inula* (tropical trixis), *Xylosma flexuosum* (brush-holly), and *Randia rhagocarpa* (crucillo) may occur as shrubs or in the sub-canopy, and some individuals of a few of these species may reach heights of 4 to 5 meters. This shrub or understory

layer can be extremely dense, almost impenetrable. Woody cover, including the patchier overstory canopy and the almost continuous shrub/understory layer, often reaches greater than 90%. This system is sometimes referred to as a tall shrubland, since shrubs are often the dominant lifeform, but frequently reach heights resembling the stature of woodland. *Prosopis glandulosa* (honey mesquite) may occasionally be absent or uncommon in the canopy, and is generally not dominant except in disturbed situations. The herbaceous layer is generally represented by a only a few species and is relatively sparse, with species such as *Rivina humilis* (pigeonberry), *Plumbago scandens* (climbing plumbago), *Celosia nitida* (West Indian cock's comb), *Chromolaena odorata* (crucita), *Leersia monandra* (bunch cutgrass), *Digitaria californica* (Arizona cottontop), *Setaria* spp. (bristlegrasses), *Salvia coccinea* (tropical sage), *Petiveria alliacea* (hierba de las gallinitas), *Malvastrum americanum* (Rio Grande false-mallow), *Urtica chamaedryoides* (slim stinging nettle), *Verbesina microptera* (southern frostweed), *Calyptocarpus vialis* (straggler daisy), and *Justicia pilosella* (hairy tubetongue) sometimes present. Vines such as *Serjania brachycarpa* (littlefruit slipplejack), *Urvillea ulmacea* (apaac), *Cocculus diversifolius* (orientvine), *Mikania scandens* (climbing hemp-weed), *Cardiospermum* spp. (balloon-vines), *Chiococca alba* (David's milkberry), *Cissus trifoliata* (ivy treebine), and *Passiflora* spp. (passionflowers) may also be commonly encountered. The rather rare epiphyte *Tillandsia baileyi* (Bailey's ballmoss) may be found in these woodlands, along with the more common *Tillandsia recurvata* (ballmoss) and *Tillandsia usneoides* (Spanish moss). Younger occurrences, especially those occupying drier sites, tend to present as shrublands, often dominated by similar, though shorter, canopy species. These occurrences also tend to be less diverse, lack the layered structure, and usually support fewer epiphytes. This system differs from the related **Tamaulipan Floodplain** system in that it has higher diversity, a significant evergreen component to the canopy, a higher subtropical component to the species assemblage, is restricted in range to the Rio Grande delta and vicinity, and often occurs as slight rises in the otherwise relatively level landscape.

**VEGETATION TYPES:**

**Rio Grande Delta: Evergreen Thorn Woodland (7802)**

Rio Grande Delta Evergreen Thorn Woodland and Shrubland
**Identifier:** **MoRAP Code:** 7802
**Description:** This type has broadleaf evergreen species such as *Ebenopsis ebano* (Texas ebony) and *Ehretia anacua* (anacua) making up a significant portion of the overstory canopy, and usually has a dense shrub layer of numerous species present.

**Rio Grande Delta: Deciduous Thorn Woodland and Shrubland (7804)**

Rio Grande Delta Deciduous Thorn Woodland and Shrubland
**Identifier:** **MoRAP Code:** 7804
**Description:** Woodlands with increased dominance of deciduous species such as *Celtis laevigata* (sugar hackberry), *Ulmus crassifolia* (cedar elm), and *Celtis ehrenbergiana* (granjeno).

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**North American Warm Desert Riparian Woodland and Shrubland**
**Identifier:** CES302.753

**Geology:** This system occupies Quaternary Alluvium as well as nearby Cretaceous limestones through which drainages flow.

**Landform:** Relatively level floodplains and low landscape positions along drainages. Upper portions of these drainages are often flashy, and many are only infrequently and briefly inundated.

**Soils:** Loamy Bottomland, Salty Bottomland, and Draw are the most frequent Ecological Sites to be occupied by this system.

**Description:** This system occurs along drainages and floodplains of the Pecos River and its tributaries and westward within Phase 4. In addition to the woodland and shrubland expression of this system, sparsely vegetated areas also commonly occur. Sparsely vegetated sites may be mapped on gravel bars, mud flats, or exposed rock within drainages, but may also have sparse woody or herbaceous vegetation including species such as *Brickellia* sp. (brickellbush), *Chilopsis linearis* (desert willow), *Baccharis* sp., (baccharis), *Prosopis glandulosa* (honey mesquite), and *Salvia farinacea* (mealy sage). Phase 4 represents the eastern edge of this system and the composition and structure grades into the floodplain and riparian systems of the Edwards Plateau. In particular, some of the sites on larger drainages have significant areas dominated by *Quercus fusiformis* (plateau live oak) and these occurrences are considered Edwards Plateau floodplain or riparian vegetation. The native streamside vegetation along the large drainages of the Pecos River and Howard Draw is frequently displaced by extensive areas of *Tamarix* sp. (saltcedar) and/or *Arundo donax* (giant reed). Overstory canopy is typically not well-developed but contain species such as *Celtis laevigata* var. *reticulata* (netleaf hackberry), *Salix nigra* (black willow), *Prosopis glandulosa* (honey mesquite), and *Sapindus saponaria* var. *drummondii* (western soapberry). Low woodlands and shrublands with species such as *Salix exigua* (Texas sandbar willow), *Baccharis* sp. (baccharis), *Brickellia laciniata* (splitleaf brickellbush), *Chilopsis linearis* (desert willow), *Juglans microcarpa* (little walnut), *Fallugia paradoxa* (Apache plume), and *Celtis ehrenbergiana* (granjeno) are present and sometimes patchy.

**Trans-Pecos: Riparian Barren (8700)**

North American Warm Desert Riparian Sparsely Vegetated
**Identifier:** CES302.753.01 **MoRAP Code:** 8700
**Description:** Sparsely vegetated gravel bars, sand bars, or bare rock with scattered individuals or small areas of *Juglans microcarpa* (little walnut), *Chilopsis linearis* (desert willow), *Baccharis* sp. (baccharis), *Brickellia* sp. (brickellbush), or other species.

**Trans-Pecos: Riparian Woodland (8704)**

North American Warm Desert Riparian Woodland
**Identifier:** CES302.753.02 **MoRAP Code:** 8704
**Description:** Woodlands along drainages where the overstory may be composed of species such as *Salix nigra* (black willow), *Sapindus saponaria* var. *drummondii* (western soapberry), *Celtis laevigata* var. *reticulata* (netleaf hackberry), and/or *Prosopis glandulosa* (honey mesquite). Some occurrences mapped as these woodlands may be dominated by *Tamarix* sp. (saltcedar).

**Trans-Pecos: Riparian Shrubland (8706)**

North American Warm Desert Riparian Shrubland
**Identifier:** CES302.753.03 **MoRAP Code:** 8706
**Description:** Shrublands along drainages with species such as *Baccharis* sp. (baccharis), *Brickellia* sp. (brickellbush), *Salix exigua*

## Herbaceous Wetlands

**Edwards Plateau Upland Depression**
**Identifier**: CES303.654

**Geology:** Massive Cretaceous limestones, such as Edwards Limestone.
**Landform:** Internally draining depressions of karstic origin on level plateau surfaces.
**Soils:** Loams and clay loams, often mapped as Lakebed or Clay Flat ecoclass.

**Description:** This system includes shallow wetlands formed over limestone on the Edwards Plateau of Texas. Variable in size and duration of inundation, occurrences of this system are typically found on level uplands and are somewhat circular in configuration. Dominant vegetation includes both graminoids and forbs tolerant of wet periods but not necessarily wetland-dependent. Dominant species may include *Pleuraphis mutica* (tobosa), *Buchloe dactyloides* (buffalograss), *Tridens albescens* (white tridens), *Sedum pulchellum* (widowscross), *Sedum nuttallianum* (yellow stonecrop), *Sporobolus vaginiflorus* (poverty dropseed), *Chaetopappa bellidifolia* (hairy leastdaisy), *Ambrosia psilostachya* (western ragweed), *Paronychia* spp. (whitlow-wort), and the alga *Nostoc commune* (blue-green algae). *Panicum obtusum* (vine-mesquite), *Bothriochloa barbinodis* (cane bluestem), *Pascopyrum smithii* (western wheatgrass), *Bouteloua gracilis* (blue grama), *Chenopodium album* (lambsquarters), *Helianthus ciliaris* (blue-weed), and *Solanum elaeagnifolium* (silverleaf nightshade) may also be present. Some larger occurrences of this wetland system are found in Crockett, Reagan, Schleicher, Irion and Sterling counties in the northwest Edwards Plateau (the Eldorado Plateau). Formation of these occurrences is apparently from solution of the underlying limestone.

**VEGETATION TYPE:**

**Edwards Plateau: Playa (1507)**

Edwards Plateau Upland Depression
**Identifier:** CES303.654.9 **MoRAP Code:** 1507
**Description:** As described for system.

**Texas-Louisiana Coastal Prairie Pondshore**
**Identifier:** CES203.541

**Geology:** This system occurs on the coastal Pleistocene terraces, including the Beaumont and Lissie Formations.

**Landform:** Local topographic lows such as ponds and swales within the generally level landscape.

**Soils:** Soils tend to be fine-textured, or are characterized by a relatively impermeable subsurface horizon.

**Description:** This system occurs as ponds or swales within the coastal prairie matrix. Soils are poorly-drained, and surface water from rainfall and local runoff is retained for much of the year (except for periods of high evapotranspiration). Occurrences are wetter than the *Tripsacum dactyloides* (eastern gamagrass) or *Panicum virgatum* (switchgrass) dominated prairie sites of the **Texas-Louisiana Coastal Prairie**. These wetlands are primarily herbaceous, sometimes with sparse woody cover, and are composed of various species, such as *Eleocharis quadrangulata* (squarestem spikesedge), *Fuirena squarrosa* (hairy umbrellasedge), *Cyperus haspan* (sheathed umbrellasedge), *Cyperus virens* (green flatsedge), *Rhynchospora* spp. (beaksedges), *Leersia hexandra* (clubhead cutgrass), *Steinchisma hians* (gaping panicum), *Panicum virgatum* (switchgrass), *Andropogon glomeratus* (bushy bluestem), *Xyris jupicai* (Richard's yellow-eyed grass), *Centella erecta* (erect centella), *Sagittaria papillosa* (nipplebract arrowhead), *Sagittaria longiloba* (longlobe arrowhead), *Ludwigia glandulosa* (Torrey water-primrose), *Ludwigia linearis* (narrowleaf water-primrose), *Bacopa* spp. (waterhyssops), *Hydrocotyle* spp. (pennyworts), *Symphyotrichum subulatum* (hierba del marrano), and *Sesbania* spp. (rattleboxes). Large areas of some of the occurrences may be relatively homogeneous, dominated by one or a few species. Areas of open water within the ponds may contain floating and submerged aquatic species, including *Stuckenia pectinata* (sago pondweed), *Ceratophyllum demersum* (coontail), *Brasenia schreberi* (Schreber watershield), *Nymphoides aquatica* (largeleaf floating heart), and *Nelumbo lutea* (yellow lotus).

**VEGETATION TYPE:**

**Gulf Coast: Coastal Prairie Pondshore (5307)**

Texas-Louisiana Coastal Prairie Pondshore
**Identifier:** CES203.541 **MoRAP Code:** 5307
**Description:** As described for system.

## Agricultural and Other Human-related Mapped Types

**Row Crops (9307)**

**MoRAP Code:** 9307
**Description:** This type includes all cropland where fields are fallow for some portion of the year. Some fields may rotate into and out of cultivation frequently, and year-round cover crops are generally mapped as grassland.

**Urban High Intensity (9410)**

**MoRAP Code**: 9410
**Description:** This type consists of built-up areas and wide transportation corridors that are dominated by impervious cover.

**Urban Low Intensity (9411)**

**MoRAP Code:** 9411
**Description:** This type includes areas that are built-up but not entirely covered by impervious cover, and includes most of the non-industrial areas within cities and towns.

## Mainly Natural Azonal Mapped Types

**Barren**

**MoRAP Code:** 9000
**Description:** This type includes areas where little or no vegetative cover existed at the time of image data collection. Large areas cleared for development are included, as well as rural roads and buildings and associated clearing in primarily rural areas. Stream beds with exposed gravel or bedrock, rock outcrops, quarries, and mines may be mapped as this type. Fallow fields or areas within cropland blocks that remain barren throughout one growing season or heavily grazed pastures where bare soils are dominant may also be mapped as barren.

**Marsh (9007)**

**MoRAP Code:** 9007
**Description**: Areas mapped as marsh are small, and consist of wet or alternately wet and dry soils with herbaceous vegetation. These are often near tanks or ponds, and may contain *Typha* spp. (cattails), *Eleocharis* spp. (spikerushes), *Schoenoplectus* spp. (bulrushes), other sedges,*Polygonum* spp. (smartweeds) and grasses such as *Sorghum halepense* (Johnsongrass) or *Cynodon dactylon* (Bermudagrass) as important species. Some shrubs such as *Cephalanthus occidentalis* (common buttonbush) and *Salix nigra* (black willow) may be important in this mapped type.

**Native Invasive: Deciduous Woodland (9104)**

**MoRAP Code:** 9104
**Description:** This broadly-defined type may have *Celtis laevigata* (sugar hackberry), *Ulmus crassifolia* (cedar elm), *Acacia farnesiana* (huisache), or *Prosopis glandulosa* (honey mesquite) among the dominants. To the south, species such as *Celtis ehrenbergiana* (granjeno), *Zanthoxylum fagara* (colima), and *Diospyros texana* (Texas persimmon) are more common.

**Native Invasive: Huisache Woodland or Shrubland (9124)**

**MoRAP Code:** 9124
**Description:** This broadly-defined type often has invasive shrubs or small tress such as *Acacia farnesiana* (huisache), *Prosopis glandulosa* (honey mesquite), *Celtis laevigata* (sugar hackberry), *Ulmus crassifolia* (cedar elm), or *Sideroxylon lanuginosum* (gum bumelia), among the dominants. In Phase 4, it is associated with sites on the Coastal Prairie and disturbed sites.

**Native Invasive: Juniper Shrubland (9105)**

**MoRAP Code:** 9105
**Description:** *Juniperus ashei* (Ashe juniper) and/or *Juniperus pinchotii* (redberry juniper) dominate these shrublands. To the west *Juniperus pinchotii* (redberry juniper) may be the dominant, while *Juniperus ashei* (Ashe juniper) is more common to the east, though they occur together.

**Native Invasive: Juniper Woodland (9101)**

**MoRAP Code:** 9101
**Description:** This type may be dominated by *Juniperus ashei* (Ashe juniper) and/or *Juniperus pinchotii* (redberry juniper). *Quercus fusiformis* (plateau live oak) is a common component, and species such as *Celtis laevigata* (sugar hackberry) and *Ulmus crassifolia* (cedar elm) may occur throughout.

**Native Invasive: Mesquite Shrubland (9106)**

**MoRAP Code:** 9106
**Description:** *Prosopis glandulosa* (honey mesquite) is often the dominant species of this broadly-defined type, but species such as *Acacia farnesiana* (huisache), *Celtis laevigata* (sugar hackberry), *Ulmus crassifolia* (cedar elm), *Ziziphus obtusifolia* (lotebush), *Mahonia trifoliolata* (agarito), *Diospyros texana* (Texas persimmon), *Celtis ehrenbergiana* (granjeno), and *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), and *Cylindropuntia leptocaulis* (tasjillo) may also be important. This type is generally mapped on disturbed soils, blackland soils, clay loams of the Edwards Plateau, playas, and clays and clay loams of the Coastal Prairie.

**Non-native Invasive: Saltcedar Woodland and Shrubland (9204)**

**MoRAP Code:** 9204
**Description:** These woodlands and shrublands are generally dominated by *Tamarix* spp. (saltcedars) to the exclusion of other species. Species such as *Baccharis* spp. (baccharis), *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), and *Salix nigra* (black willow) may be present, but usually as scattered individuals.

**Non-native Invasive: Giant Reed (9207)**

**MoRAP Code:** 9207
**Description:** Areas mapped within this type are often dominated by nearly pure stands of *Arundo donax* (giant reed), often along drainages, particularly along the Rio Grande.

**Invasive: Evergreen Shrubland (9505)**

**MoRAP Code:** 9505
**Description:** A variety of shrublands associated with disturbed sites with species such as *Acacia farnesiana* (huisache), *Baccharis* spp. (baccharis), *Rosa bracteata* (Macartney rose), *Triadica sebifera* (Chinese tallow)(northeast), *Prosopis glandulosa* (honey mesquite), *Ziziphus obtusifolia* (lotebush), *Zanthoxylum fagara* (colima), *Celtis ehrenbergiana* (granjeno), and *Condalia hookeri* (brasil) characterize this type. Sparse tree cover with species such as *Quercus fusiformis* (plateau live oak), *Celtis laevigata* (sugar hackberry), and *Ulmus crassifolia* (cedar elm) may also occur.

**Open Water (9600)**

**MoRAP Code:** 9600
**Description:** In addition to large lakes and rivers, ephemeral ponds may be mapped as open water. Some mapped areas may support vegetation with pioneering species such as *Salix nigra* (black willow), *Populus deltoides* (eastern cottonwood), *Triadica sebifera* (Chinese tallow), *Suaeda* spp. (seepweeds), *Borrichia frutescens* (sea ox-eye daisy), *Batis maritima* (saltwort), *Juncus* spp. (rushes), sedges, *Typha* spp. (cattails), and *Eleocharis* spp. (spikerushes).

**South Texas: Disturbance Grassland (9187)**

**MoRAP Code:** 9187
**Description:** A variety of mainly heavily grazed grasslands, including managed exotic pastures, are circumscribed within this type. Common dominant species include *Cynodon dactylon* (Bermudagrass), *Dichanthium annulatum* (Kleberg bluestem), *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), *Pennisetum ciliare* (buffelgrass), *Aristida* spp. (threeawns), and *Urochloa maximum* (guineagrass). Shrubs and small trees such as *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), *Ziziphus obtusifolia* (lotebush), *Celtis ehrenbergiana* (granjeno), *Acacia rigidula* (blackbrush), and *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear) are common components.